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Archive

The Subscription Magazine for Archimedes Users

Using BBC Hard Drives on Archimedes

Mathematical Applications

Graphics Applications

Programs for Special Needs Applications

Introduction to C – Part 4

Reviews: First Word Plus 2, Spark, Genesis, MultiStore versus Pipedream 3, Acorn Assembler, Cfront, Cambridge Pascal.

Another controversial issue?

It seems that this issue contains more than usual in the way of controversial comments. As you read through, you will find comments about pricing of software, copy protection, where Acorn should go in the future, the relative merits of various pieces of software etc, etc. I have no doubt we will have a full postbag in the days ahead. I suspect, too, that some of the software and hardware producers may not take too kindly to the criticisms they have received at the hands of the reviewers...

Independent User Group?

"Would it be fair to say that Archive is independent?" "Can you trust the reviews in Archive?" Well, first of all, we have made a deliberate policy of not producing any hardware or software of our own so we have nothing to gain or lose from comparative reviews.

"Are the reviewers competent?" Well, I cannot make any guarantees about that. Obviously we know our regular contributors. If we trust them, we ask them to write more reviews but often people whom we know little or nothing about, offer to do reviews. I suppose they could be agents of a software house – I have no way of checking, I'm afraid, but if a biassed review does appear, it's not long before someone lets us know and we air those comments in future issues.

"But you take advertising, so how can you be independent?" (See Bruce Smith's comments in February A & B Computing.) Firstly, we never try to sell advertising. If companies are interested in advertising, we send them a rate card which gives the standard series discounts – no other discounts are given. If a supplier ever threatened to withdraw his advertising because he didn't like what we were saying (thankfully, no one has ever done so), we would tell him, politely, what to do with his advert!

We do our best to give a good service to you, the reader, but if there is any way you think we could improve it, do let us know.

Very best wishes for 1990!

Paul B

Government Health Warning: Reading this may seriously affect your spiritual health.

"Well, Paul, what is a Christian, anyway? Isn't it someone who tries hard and does good to everyone?" Well, no, not if you take the bible's definition of a Christian. Don't get me wrong though, if you **are** a Christian, I would expect to see that sort of attitude growing in you, but that isn't what **makes** you a Christian. *"OK, it's someone who believes in God and goes to church!"* No, not really. Of course you must believe in God otherwise you wouldn't take Christ seriously, and yes, if you **are** a Christian, I would expect to that you would **want** to go to church, but that isn't what **makes** you a Christian. (Actually, I **love** going to church. There's nowhere else I'd rather be on a Sunday. There are churches like that, you know – there's probably one somewhere near you. Give us a shout if you want to find one – we have a number of contacts with lively churches. But I digress...)

"OK, Clever Clogs, what does make you a Christian?" Is that just an academic question? Or do you really **want** to know? OK then, start by reading one of the gospels and find out what Jesus actually said. As I said last month, if you can't find a modern translation of the bible, let us know and we will happily send you a copy of one of the gospels, free of charge. Have a read, and let us know what you think. If you don't understand it, ask us and we'll see if we can help. Jesus might just have been right, you know, and it would be a shame if you missed out!

Archive

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Contents

Archive magazine is edited by Paul Beverley and published by Norwich Computer Services.

Products Available

• **A3000 memory boards** from Morley Electronics. We've tried them out and they seem fine. They are easy to fit (as are all the A3000 memory boards), the main problem being to open the case of the computer without breaking off the plastic clips along the front edge! (1M – £140, 3M – £395)

• **ARM3 units** from Aleph One Ltd have been in short supply for a long while but are now beginning to be more readily available. We hope to have some in stock (£650) by the time you read this.

• **BookBinder** from Musbury Consultants (£55) is a new RISC-OS application based on HyperCard. It enables you to create 'books' containing pages of text, bit mapped images and !Draw objects. It could be used, for example, to create multiple choice quizzes, interactive fiction/ databases, etc.

• **Careware 5** contains Printer Buffer Module, Sinclair QL utilities, four Overscan Screen modes, KXP1124 driver for FWPlus, Presentation program (bar charts, pi charts, line graphs, etc), Teletext Screen Editor, BBC Font Designer, Key Strip Editor, 32,768 colour demo, GMA demo, Poker, Quartet (desktop game), Simon. The two demos are really stunning – the first gives a display of 32,867 different colours on screen at the same time which is done by screen switching and the second combines a sound-tracker providing a musical accompaniment to a scrolling text display (I like their sense of humour!) and a range of 3-D graphics. All credit, and grateful thanks for the two demos, to the programmers at GMA in Hamburg who are doing so much at the moment to enhance things in the Archimedes world.

• **Family Favourites** from Minerva (£19.95 or £18 through Archive) is now available – Brain Drain (= Pelmanism), Dead End and Gridlock (based on Othello).

• **First Word Plus Release 2** is available now price £79.95 + VAT or £82 through Archive. The upgrade is £39.00 + VAT + £5.20 p&p if you send your old disc to Vector Services.

• **Free colour monitors!** – Acorn were offering special deals through distributors before Christmas. We managed to buy up some of these and so we can offer (while stocks last) a free Acorn colour monitor with each Archimedes 410 purchased through Archive. (This is an **alternative** to the £100 worth of free software we normally give with A410's) If you buy an A3000, you can have an Acorn colour monitor at half price – £125. The price of RAM for the A410 now seems to have stabilised. We are selling it at £110 per Mbyte but at £100 per Mbyte if you buy it with the computer.

• **Hyperbook** – a new dimension in text-based research and investigation from Logotron. The Hyperbook Reader (£49 +VAT) allows you to read, search and edit texts you create yourself or those published commercially. Current titles, (£15 + VAT each except as marked) include: Economics Issues, Social Issues, Geography issues, Science & Technology (£25), Education Reform Act (£20), Hamlet, Pride & Prejudice, The French Revolution, 20th century History, The Gospels, Pollution.

• **MEMC1a's in stock.** Acorn seem reluctant to release MEMC1a's as upgrade kits for 310's and old 440's and the dates they give for availability have been slipping back and back. However, don't despair, we have been able to second-source them so we have some in stock at £74. Remember that they are a dealer upgrade, though they do come with fitting instructions.

• **Order & Chaos** – Investigating non-linear systems using Logotron's Numerator package (reviewed 2.12 p 46). The package includes a learning text, a disc of Numerator examples and a copy of James Gleick's 352 page book, "Chaos – Making a New Science". £15 + VAT.

• **Procass** is a National Curriculum Assessment package for BBC Micro and Acorn Archimedes. It covers various topics and various levels. Details from Patricia Grice, 23 Balfour Road, Southport, Merseyside, PR8 6LE. (0704–31139 or 051–548–0002)

• **Silicon Vision** have been doing RISC-OS updates to various items on their software list. The new versions of SolidCAD and Realtime Solids Modeller will be £99.95 and £149.95 respectively – upgrades for existing owners are £50. Film-Maker can be upgraded for £10

• **Star LC-10 Printer Driver** – Ace Computing have produced a RISC-OS printer driver for the Star LC-10 (£15 inc VAT).

• **SCSI TapeStreamers** from Oak Computers are now available. They come in two sizes 60M per tape and 150M per tape. The prices are £999.95 + VAT and £1254 + VAT (or £990 and £1250 through Archive, inc VAT). They have their own software for selective backing up and restoring but they will also work with DiscTree from Mitre Software.

Review Software Received... Apart from reviews already being written we have received review copies of the following software: Family Favourites; Cops; Z88 – A Dabhand Guide; Hyperbook Reader plus 3 texts – Hamlet, Science & Technology Issues and 20th century History; Numerator Chaos. A

Forthcoming Products

• **Bug Hunter + Moon Dash** – two games in one pack from Minerva (£17.95 or £17 through Archive) – splat the bugs or destroy the aliens.

• **Business Software** – Silicon Vision are soon to release a suite of business software: **DataVision** – a fully relational database management system (£99.95), **Financial Accountant** (£175) – a complete integrated business accounting & database package which includes DataVision and **ShareHolder** (99.95) – a share holder's management system. **OfficeTools** at £295 is a compilation of the above three packages plus the existing Presentation System package for generating material for lectures and demonstrations.

• **Caverns**, a new game from Minerva (£17.95), lets you control a spaceship through a network of caves defended by enemy installations.

• **Colour video digitiser / frame grabber** from Pineapple Software is due for release in February. It is a low price product but it has a fairly high specification – 512 * 256 in 12 bit resolution (£285 + VAT) or 16 bit resolution (£315 + VAT).

• **Maddingly Hall**, a new game from Minerva (£14.95). This is an adventure game with text and pretty pictures.

• **Mindwarp** – a fast action space-invader type game from Future Software, £14.95.

• **Noah Tools #3** from GMA, £10 + VAT contains !BootGen – boot file generator, !AutoMount – automatic disc mounting, opens/closes directory viewer, !SetupUtil – creates configuration files, !Demo#3 – animations demo and Assembler – 7 useful assembler routines.

• **Outline Font Packs** – Following the launch of the Acorn Desktop Publisher package, Acorn has decided to make available packs of stand-alone fonts for users of other applications. The first of these will be the Outline Font Starter Pack which will contain the Outline Font Manager module and the 12 basic fonts (Trinity medium, bold, medium italic and bold italic, Homerton and Corpus medium, bold, medium oblique and bold oblique). Another pack containing 4 styles of Newhall (New Century School Book) and further font packs are also planned.

• **SolidsRender** (£99.95) from Silicon Vision should be available by the end of January and will provide ray tracing facilities somewhat more comprehensive than the currently available PD ray-tracer packages. **SolidTools** (£275) is a compilation of Realtime Solids Modeller, FilmMaker and Solids Render and therefore will be available as soon as SolidsRender is ready.

• **Talisman**, a new game from Minerva (£14.95) – travel around the castle and pick up all the hidden bits of the sacred talisman.

• **Trivial Pursuit**, £19.95 from Domark Ltd was reviewed in the January edition of Micro User but we have not yet been able to get hold of it. It seems to have quite good graphics and a reasonable range of questions. A

Hints & Tips

• **80k of RMA and rising!** RMA stands for Relocatable Module Area. In English, this is the area of memory which some parts of the operating system (modules) use as work space. This is why when you first initialise your computer you will find that you RMA takes over 80k of memory. For those of you who are curious, here is a guide to the memory each module claims on power up:

Module	Workspace (bytes)
FileSwitch	2400
Desktop	528
SystemDevices	288
BBCEconet	80
InternationalKeyboard	528
Debugger	448
SoundChannels	8464
SoundScheduler	8208
WaveSynth	1760
StringLib	8576
Perussion	8800
SpriteExtend	1296
Draw	272
FontManager	2832
WindowManager	7920
NetStatus	16
Podule	208
ADFS	656
FileCore%ADFS	12,464
HourGlass	1952
TaskManager	3760
PaletteUtil	3632
Filer	4992
ADFSFiler	2336
ShellCLI	1872
Total	**84308**

RMA is also used to contain WIMP sprites (especially application icons stored in their !Sprite files) and relocatable modules, which add extra facilities to the ROM based operating system e.g. 65Tube provides BBC B emulation. This means that as the Archimedes 'sees' and loads more applications/ modules the memory acquired by the RMA grows and can quite easily reach 300k plus!

Since there are several uses for the RMA, there are several ways of reducing the memory it acquires:

a) Remove individual modules using the *RMKill command e.g. *RMKill Percussion – this will only temporarily remove the facilities provided by a module.

b) Unplug unwanted modules using the *RMUnplug command e.g. *RMUnplug BBCEconet – this will permanently remove the facilities provided by an operating system ROM module – so if you don't have Econet or don't use the Debugger then you can unplug the relevant modules and release their workspace. Note: you can reinvoke the facilities of a module by using the *RMReInit command.

c) Use the following BASIC V program to clear the RMA sprite area:

```
10 REM >SpriteNew
20 SYS "Wimp_BaseOfSprites" TO
                          ,rmasprites%
30 SYS "OS_SpriteOp",&109
                          ,rmasprites%
```

d) If you have finished processing and saved all your work you could press <ctrl-break> but this is rather drastic.

• **ArcTerm update** – Hugo Fiennes has updated ArcTerm v6.01 so that works properly with the CET and CET+ standards. An upgrade can be obtained direct from Hugo Fiennes free of charge.

• **Arthur desktop** – If any of you have changed over to RISC-OS but are pining for the old Arthur desktop(!) then see if you can get hold of a copy of Brainsoft's Disk Transfer program. This provides a modified ram copy of the desktop with extra features added. You will then be able to access you old desktop diaries etc. Dave Woods.

• **ASCII BASIC programs** – BASIC V can load and renumber an untokenised text file with the *BASIC –load <filename> command (the same applies with the –chain option). Thus you don't really need a BASIC to ASCII convertor; you could just keep all your BASIC programs in ASCII, at least while you develop them, and still be able to edit them using a text editor e.g. TWIN or !Edit.

• **Auto-booting applications** – If you want a RISC-OS application to load or run as soon as the disc is inserted then you should modify the !Boot file in the application to execute the !Run file i.e. add the command *Run <Obey$Dir>.!Run in the !Boot file. This technique could be used, for example, to automatically load the BASIC Editor when a development disc is inserted.

• **Break key action** – You can set the action of the <break> key using the *FX 247,<n> command. The value byte <n> alters <break> and modifiers of it as follows:

Bits	Key Combination
0,1	<break>
2,3	<shift-break>
4,5	<ctrl-break>
6,7	<ctrl-shift-break>

Each two bit number may take on one of these values:

Value	Effect
00	Act as <reset> key
01	Act as <escape> key
10	No effect
11	Undefined

The default is *FX 247,1 which makes <break> act as if it were <escape> and all other combinations cause a reset.

• **Desktop grey scale?** If you modify colours 0 or 7 (white or black) using the desktop palette utility then the palette application will attempt to interpolate the colours in between i.e. colours 1-6. Try it and see!

• **Don't move your mouse!** Whilst waiting for a program to complete a lengthy process (e.g. when the hourglass is on) it is best not to move the mouse as keeping track of the mouse movements takes up processor time.

• **Faster BASIC SWI's** – When using the SYS command within a BASIC V program, it is quicker to use a number instead of a string e.g. SYS 6 instead of SYS "OS_Byte". However, the best way to obtain the number values is to use a BASIC variable and "OS_SWINumberFromString". This increases speed while maintaining machine independence and readability. For example:

```
PROCinitialise
:
REM main program
SYS os_byte,0 : REM the
    equivalent of *FX 0
END
:
DEFPROCinitialise
SYS "OS_SWINumberFromString",
    "OS_Byte" TO os_byte
ENDPROC
```

• **Insert/overwrite with !Edit** – It is possible to toggle between insert and overwrite mode in Edit by pressing <shift-f1>.

• **Mouse step** – you can set the sensitivity of your mouse by using the BASIC V MOUSE STEP command e.g. MOUSE STEP 4 means that the pointer will move 4 O.S. pixels for every mouse pulse. The 'sensitivity parameter' can take a zero or even a negative value, so that you can freeze the mouse or even invert it!

• **Multiple entry PROCs and FNs** – You can have multiple entries to procedures and functions, although it may not be good programming style. This is because lines beginning with DEF is not executed, so you can have further DEFs within the body of a procedure/function, and enter at these points with an appropriate call – this might be particularly useful to have a first entry, set up some default parameters, and then have another entry to override them:

```
DEF PROCproc_with_defaults
LOCAL A,B
A=1:B=2
DEF
    PROCproc_without_defaults(A,B)
:
REM procedure code
:
ENDPROC
```

• **O.S. case sensitivity** – Contrary to what has been said in the past, the operating system is almost entirely case-insensitive, unlike BASIC, and although the case of filenames and variable names is preserved it is not significant. Quotes are also generally unnecessary except when including a space in a parameter.

• **Removing recursive directories** (cont'd) – If you accidently copy a directory into itself then the best way to tidy the disk up is to create a RAM disc and move the unwanted files into it (you can move a file by dragging it into the filer window while holding the <shift> button down).

• **Time for function keys** – Function key strings are just treated as OS variables called Key$<n>, where <n> is the key number. This means that all the commands related to system variables can be used with function keys, e.g. *Show Key$* will display key definitions, *SetMacro Key$0 <Sys$Time> will make <f0> display the time and so on.

• **Using *GOS** – You can use the *GOS command from the desktop to prevent returning if you accidentally hit the <return> key. Once you have finished typing your *commands you can use the *Quit command to go back to the desktop. A

Competition Corner

Colin Singleton

With the festivities over, we can get down to the serious business of puzzle-solving!

Firstly, an apology. Unfortunately a small bug crept into the text of the December Competition. A 'pin' is a four and a half gallon barrel, not 4. This means that the solution to the short-list problem is different from the one I expected. I will accept either. Your generalised program should, of course, solve both.

The Puzzle

How good are you at jig-saw puzzles? This month's problem probably does not lend itself to computer solution, though if anyone does achieve any reasonable results on their Archimedes I would be interested to hear about it. The problem is, I think, best tackled by the 'Blue Peter' approach – using card and scissors!

You can quickly verify that $1^2 + 2^2 + ... + 24^2 = 4900 = 70^2$. This is the only sequence of consecutive squares starting at one which totals a square. (Ten extra Brownie Points if you can prove it!) So, given 24 square tiles, 1x1, 2x2 ... 24x24, is it possible to fit them together to form a 70x70 square? No, it is not! (I don't think you will manage to prove that even with the help of Archimedes.)

So what is the problem? The problem is to cover as much as possible of a 70x70 square using the 24 square tiles. In fact there are two separate problems. In the first, the tiles are not permitted to overlap, hence at least one will not be used. In the second, the tiles may overlap and are all used. They must have their edges aligned to the unit grid lines of the large square. (As a separate exercise, you might like to try to improve your solution by placing tiles at odd angles.)

You can send in your diagrams if you wish but initially all I really need for the short list is a picture postcard of your home town with a note of the numbers of units squares **not** covered by tiles. Two answers please, one for each problem.

Entries, and comments on Archive Competitions past present or future, either via Paul at NCS or to me at 41 St Quentin Drive, Sheffield, S17 4PN. A

Help!!!

• **A Good Idea?!** – There is quite a lot of software available for the Archimedes that does not make use of the mouse. One example which comes to mind is Logistix. It would be possible to use the mouse with such applications if someone would write a Relocatable Module which would convert mouse movements into pushes of the cursor buttons. In fact this is how Amstrad implement their mouse. As part of such a project, the "select" button could give a <return> and another could give <escape>. Brian Cowan.

• **Portrait Printing** – Does anyone know how to print A4 portrait documents using !!Draw (or Acorn DTP), !PrinterDM and an 80 column dot matrix printer? Contact Michael Lowe at 120 Lower Park Road, Loughton, Essex, IG10 4NE.

• **Statistics / numerical data-handling** programs are available on the Archive programs 3.2 magazine disc. The author has some additional companion programs e.g. a 3D bar effect chart generator and regression (for orders up to 6). These are available from Bob de Vekey by sending a blank formatted disc and return p&p to 215 Hempstead Road, Watford, WD1 3HH. A

Comment Column

• **A Glossary of Computer Terms**

Assembler – A person who can assemble a computer

Assembly Language – The langauage used by a person experiencing difficulty assembling a computer

Bit – A piece of your computer that detaches unexpectedly

Bug – An abbreviation of a well known swear word

Character – A personality trait essential for people stupid enough to get involved with computers

Data – Erroneous information given to a computer with which it is expected to perform miracles

Debug – De problem wid de compuder

File – An abrasive metal tool which should never be put near a computer

Floppy disk – A spinal condition

Hard disk – The final symptoms

Hardware – A shop that sells files

Input – The initial stages of computer error

Mainframe – A process which can magnify human error to terrifying proportions

Monitor – A device which ruins your eyesight while allowing you to see what your doing wrong

Offline – Not connected and therefore blissfully unaware of the problems to come

Output – Conformation of one's worst fears

Paul Denize – The guy who wrote this lot!

Processing – The reason for the pretty flashing lights

Program – The sequence of instructions which will make the computer do what you tell it to do but never what you want it to do

RAM – What you would like to do with the program to the programmer when you are still working at midnight

Real Time – 11.26 p.m. – It just feels like midnight!

System Programmer – Someone smart enough to get into computers when the rest of the world didn't know an IBM from a BMW, and who now owns both

• **Acorn's Future (cont)** – Can I take issue with John Krakenburg's musings about Acorn's future (issue 3.2 p 17)? The point is the importance of MS-DOS compatibility. I think it would be a great mistake for Acorn to be putting too much effort into this at present. My reasoning goes like this: the current software PC emulator runs at about half the speed of a real PC and this is a drag. Fair enough, that's true but the figures suggest that the ARM3 offers about a factor of 3 speed-up over ARM 2 even without adding more expensive memory, so that the PC Emulator should start to run at a reasonable speed. After all, anyone who wants to run PC software more than occasionally is going to buy a PC anyway.

But the PC market is not where the future lies. MS-DOS is a dreadful excuse for an operating system and serious computer users are moving to other things – mostly UNIX. The graph opposite shows how the current R140 stands in the UNIX workstation market. If the 'factor of 3' speed-up is to be trusted, an ARM3 based workstation should give 12 MIPS – power equal to a SPARCstation. Acorn are already leaking the fact that they will have an 8 Mb workstation coming soon. Given that their current price for memory is £120/Mb, I see no reason why this should cost more than £500 more than an R140, allowing one to assemble a minimum standard AI workstation for under £7000, or a little over half the price of a SPARCstation.

But although such a machine would be fine for the AI market – which is what interests me – it is more limited than other workstations in that the screen is refreshed by the main processor, which limits graphics capability and, more particularly, colour resolution. The most obvious and simplest solution

would be to use something like the old Acorn Tube to strap two Archimedes together, one handling the processing and the other handling I/O. Acorn know how to do this, and seeing that the two boards could share the same case, power supply and peripherals, this should add no more than another thousand pounds to the price. This would offer truly ground-breaking price/performance.

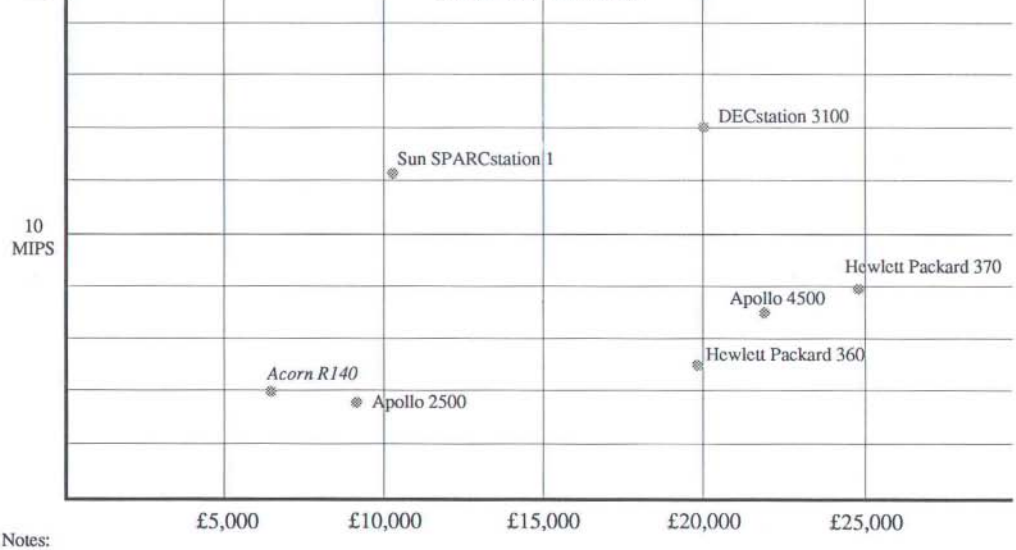
Meantime Byte publishes rumours of a 48 MHz ARM which should be good for around 20 MIPS. Acorn have a machine which could make a serious impact in the workstation market. I sincerely hope they don't get side-tracked by PCs!

RISC-OS has developed into an exceptionally nice operating system, with an exceptionally good user interface standard and far lower overheads than UNIX – I hope that it doesn't get dropped from future Archimedes. I appreciate Acorn have got to have UNIX in order to crack the market; but the 'two operating system' policy of the R140 has lots to be said for it.

Finally, networks. Networks are where you have to go with the crowd, because otherwise you can't talk to the crowd. Out here in the real world, people use Ethernet with TCP/IP and NFS. It is important that Archimedes can talk it, not only from UNIX but from RISC-OS. *Simon Brooke*

• **JetPack** – I did something unusual for me – I bought a Minerva product! On the whole I've been very disappointed with this company's products. However this, and Thundermonk which I have subsequently played, are excellent.

Both can be backed up – for personal use, of course – using the Archive copier, but I have not managed to tidy up Thundermonk. With Jet Pack however, under RISC-OS, you can scrap the configure boot file and click on the application and it runs direct from the desktop. Oh! how I wish they all did this so easily. Having backed up the disc you can rename the file from the OS to put it in a *jetpack* directory. You can then add *!sprites* and *!run* and you have *!jetpack* as a proper application. This is one of the



Notes:

Prices are UK ex VAT, from vendors published lists or directly quoted to us. Performance figures are from manufacturers published claims.

Generally, machines are priced to the following specification: 19 inch or greater mono monitor with 1 million or more pixels, 8 Mb main memory, 150 Mb or more of disc (price for DECstation includes 332 Mb), Some form of removable media storage, i.e. floppy disc drive or tape, UNIX including NFS and X 11

The exception is the Acorn R140, which is available only with 4 Mb of main memory at present, but is otherwise priced as specified.

first successful tidy ups I have done, although I have put two versions of !holedout on one disc as an application. Copying Jet Pack was not absolutely straight forward as you have to rubbish the tracks **after** copying, not **before** as the copier prompts you to do. I have changed my copy of the copier program to allow this option in future. *Brian Oliver.*

• **Marauding Modules** – There seems to have been a lot of modules in magazine listings and the like but I think people have been going over the top. Acorn's guide-lines say that modules should be avoided if possible; if they just provide * commands they could just as easily be transient utilities, without clogging up memory. The only exceptions to this should be if the command will be frequently used (e.g. the BASIC editor or a memory editor) or if they are very small (all files take up at least 1k of disc space, so it may be better to put several small routines in a module). If people really have memory to burn, they can put the utilities in a RAM disc (and add RAM: to Run$Path). *Stephen Burke*

• **Watford Memory Upgrades** – Last month, you mentioned the Watford Electronics card, but said you could not obtain one. Well, they do exist – I have a 4 Mbyte card in my A310 (A340?). However, I think they are in fairly short supply as it took three weeks of phone calls and a trip to Watford to get it fitted. *(They are now selling the cards as customer installable but they were waiting for a stock of the chip extraction tools. Ed.)*

For the 300 series, the memory upgrade consists of two cards linked by a ribbon cable. One replaces the MEMC and the other the MEMC. Both of these chips are then re-housed on the daughter cards. The cards are seated in two 68 pin sockets using a plastic square with gold plated contacts around all four sides – this looks like it is made for use in circuit emulators or some such device. There are 4 Mbytes on the card – unlike some other memory upgrades, the original memory is unused, and remains in the sockets. So far as I know, the old memory chips are either left without power, or in a low power mode and the new chips use less current, so there should be no problems there – anyone want a 0.5Mbyte upgrade cheap?

One card has to sit under any podules fitted, and the other is under the floppy disc drive. The boards themselves look professionally made, although I believe they still have some problems – mine had a dry solder joint when it was first installed. The main problem seems to be the mounting mechanism used – the boards are only supported by the connectors into the two sockets and, in my case, at least one of these is not a snug fit. This means that if I move my machine I sometimes have to open it up and resettle one of the boards to get a good contact. The fact that the ribbon cable runs right down the edge of the machine also means that putting the lid back on can nudge the board. I think that they could improve things by putting some pillars on the corners of the board to make it more stable.

I am still not really happy with this arrangement or with Watford's response to my complaint – "You have to expect problems of this sort when using daughter cards in this way". I am sure that all those people with processor upgrades in Macintoshes don't have to unscrew the case and wiggle a board about to make their machines work.

When the board is making good contact it works perfectly and I have no complaints about the actual memory. It does not seem to run hot and I have experienced no memory errors so far as I can tell.

Having 4 Mbytes lets you do a lot more with the Archimedes. I no longer have to worry about cutting down buffer sizes or terminating one application to start up another. I also use a large RAM disc to store commonly used files – in my case the C compiler, linker and associated libraries and header files. This makes compilation considerably faster. One other possible speed up (which is mentioned in the manuals) is to relocate Wimp$Scrap to a RAM disc. This makes transfer between some applications a lot faster. *Stephen Lord.*

I read about the Watford Upgrade Kit in a September magazine and, reassured by the author's experience and promises of impending availability, I sent off my deposit to Watford, together with my request for credit facilities (we teachers are a poor bunch, you know!). I then waited with anticipation for the kit to arrive. My deposit was cashed at the end of September and I had every reason to expect the kit to arrive soon. It didn't! At the end of October I paid my first instalment to the finance house and it was at this point that I telephoned Watford to

enquire when I could expect the kit. I was told that the chip extraction tools had not yet been delivered but they would do so soon. Alternatively, I could travel to Watford and they would fit the upgrade while I waited. I considered this offer for a while then telephoned to check availability but was told they were out of stock. I decided to wait for the kit.

Finally, the kit arrived on the 19th December, only 3 months after the initial order!

Naturally I set about performing the upgrade as soon as possible. When I opened the box I discovered two circuit boards, a length of ribbon cable, some photocopied instructions and the (in)famous chip extraction tool. I read the instructions carefully and then removed the cover of my computer. I removed the disc drive without too much difficulty and then attempted to remove the MEMC and VIDC chips with the tool provided. These chips are in flat packs that they lie flush with the socket and they are square. The instructions make the removal of these chips with the special tool sound easy. Believe me, it is not! The theory is that you insert the prongs of the special tool into the slots at diagonal corners of the socket, squeeze the sides of the tool gently and the chip is lifted up cleanly for removal. So much for the theory! No matter how I tried, the chips would not lift up without tilting alarmingly, causing worries about bent pins etc. After half an hour of fruitless effort and increasing anxiety (how much do replacement chips cost?) I finally threw caution to the winds and used brute force and ignorance to lever (!!!) the chips free of their sockets. I then took a tea break to settle my nerves!

Inserting the chips into the new boards was very straightforward (how ironic) and I then connected the two boards together with the ribbon cable provided. Each of the boards has a square plug attached which is designed to be inserted into the original sockets on the main board. Turning the boards upside down, I attempted to insert the plugs. I then discovered that I had attached the ribbon cable the wrong way round so that the MEMC board would not fit into the space available. The instructions were not clear about the correct way to fit the cable so it had to be detached and the boards reconnected. This having been done, I attempted once more to attach the boards and, after another struggle, finally managed to get the boards in place. I attached the power leads to the power tags on the main board, replaced the disk drive, replaced the cover and switched on.

You can imagine how my heart missed a beat when the computer reported an error! However, I reset the computer and it has worked flawlessly ever since. I had to reset many of the configured values in the CMOS RAM as they adapted themselves for the new memory page size, but I can honestly say that my pleasure on checking the memory available through the Task Manager made the whole heart-stopping exercise worthwhile. I can now run many major applications in the multi-tasking manner for which they were designed and the computer, with its excellent operating system, has now come into its own as far as I am concerned.

So, was it worth it? Despite the long wait and the difficulties of installation, I am very pleased with the upgrade. It has performed very well and opened up a large range of new possibilities for the machine. However, I would caution anyone who wishes to buy the upgrade that the installation is not as straightforward as the instruction leaflet and publicity would have you believe and, if you entertain any doubts over your ability to install the upgrade, ask a recognised dealer to perform the upgrade for you.

As a final comment, after the upgrade has been done, space around the ARM chip is very cramped so that there is not sufficient room for an Aleph One ARM3 upgrade. So if you are looking to super-charge your Archimedes with one of the new CPU's then you should consider one of the alternative memory upgrades that are now being advertised. Fitting the new MEMC1a chips should, however, be fairly easy. *Steve Holroyd.*

We have just received our first 4M board from Watford with the new metal chip extractors which I think may be easier to use than the one Steve had. The instructions are now printed (surprisingly well) with good clear diagrams. So the 2 and 4 M memory boards will be appearing on the January Archive Price List. Ed. A

Computerware

New Product Release

Archimedes A300 RAM Expansion Board.

In line with our continued commitment to the A300 user Computerware are proud to announce their new RAM expansion board. The dealer installable unit will allow the A300 to be expanded to 2 or 4Mb without the loss or relocation of the original on board RAM. The A300 can be expanded to 2Mb with our basic 1Mb board, (provided that the A300 already has its full complement of 1Mb RAM on board) and to the full 4Mb with our further 'plug in' 2Mb upgrade. Equally our expansion board can be supplied as the full version initially. The expansion unit is built to our usual high standards on a multi-layer board. ZIP RAM modules have been used to achieve the high density of packing required to allow the unit to be installed out of the way. Full compatibility with the ALEPH ONE ARM3 upgrade is maintained to give real power, at your fingertips.

The A300 RAM expansion board will be available shortly, orders are being treated as first come, first served.

Placing an order

Demand for the upgrade is very high but you can place your advance order now by sending a deposit of £25 to reserve a place in the queue. The Ram boards are 'plug-in' but still need to be installed by us due to the special tooling required. As such you will be required to send us your Archimedes when your place in the queue is reached.

A300 RAM 2Mb price £399 inc VAT

A300 RAM 4Mb price £699 inc VAT

Prices include installation and courier return of your Archimedes. Full details will be sent with notification of receipt of deposit. Further information available on request.

Hard disc drives

Computerware hard disc drives offer a fully Acorn compatible product manufactured to our high standards. Our drives are available for all the Archimedes computers, A300, A400 and A3000. A300 and A3000 versions are supplied with controller podule capable of accessing two drives, one internally and one externally through specially mounted connectors. All our drives come complete with all parts required to fully install the system, including cables, screws, metalwork etc. All our drives have an access time of less than 28ms and generate very little noise.

Hard drives for the A300

20Mb with podule £435 inc. VAT *
40Mb with podule £620 inc. VAT *

Hard drives for the A400

20Mb £229 inc. VAT
40Mb £435 inc. VAT
50Mb £574 inc. VAT
72Mb £1149 inc. VAT

Hard drives for the A3000

20Mb £459 inc. VAT
40Mb £649 inc. VAT

* *Backplane and fan required.*

Computerware 20Mb hard drives are fully autopark. Quality Seagate and NEC drives are supplied as standard with a 2 year warranty on 40Mb drives.

More New Products

Further products available from Computerware include the following;
A3000 1Mb RAM upgrade £159.85 inc. VAT
A3000 3Mb RAM upgrade TBA
A3000 Colour TV Modulator £29.95 inc. VAT
Archimedes external floppy disk buffer £24.95 inc. VAT

Watch this space for more new products

All Computerware products are covered by a 1 year guarantee.
Our prices include free overnight delivery nationwide.

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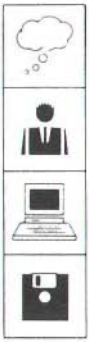
INVESTIGATOR 1.02

£24.95

THE SERIAL PORT



Investigator is a disc utility program which is compatible with the Archimedes 300, 400 and 3000 series using either the Risc OS or Arthur 1.2 operating systems. *Investigator* can perform the following operations on discs of many different formats:

- Examine the format of the disc in detail.
- Edit the data stored on the disc.
- Make backup copies of the disc.
- Store the entire disc as an ordinary ADFS file. This may allow archives of several master discs to be stored on a single backup disc. The disc may then be transmitted to a remote site using a modem and a communications package such as ARCterm.
- Fully WIMP front end.

The Serial Port, Burcott Manor, Nr Wells, Somerset BA5 1NH
Voice (0749) 72234 Data (0749) 79794 (300–2400 baud)

Please send me ☐ INVESTIGATOR 1.02 at £24.95, cheque, PO enclosed.
☐ Data Sheet

Name _____

Address _____

_____

_____

SCSI Drives – Further Comparisons

Paul Beverley

We have now got more information about the Oak Computers and Lingenuity drives to help you make your decisions about which drive to buy.

Speed tests

First of all, here are the results of various speed tests that we have done. The 20M and 45M drive tests shows the speed of an Oak drive on an Oak podule and a Lingenuity drive on a Lingenuity podule. In the case of the larger two drives, we have used a Lingenuity 100M drive on each of the two podules in turn and then an Oak 170M drive on each of the two. The following table shows the data transfer rates in kbytes/second

20M	Oak	Ling'ty	
Mode 0	607	339	(1.79 : 1)
Mode 15	607	339	(1.79 : 1)
Mode 21	55	63	(1 : 1.15)

45M	Oak	Ling'ty	
Mode 0	659	355	(1.86 : 1)
Mode 15	659	355	(1.86 : 1)
Mode 21	55	63	(1 : 1.15)

100M (Ling)	Oak	Ling'ty	
Mode 0	824	768	(1.07 : 1)
Mode 15	824	537	(1.53 : 1)
Mode 21	501	291	(1.72 : 1)

170M (Oak)	Oak	Ling'ty	
Mode 0	1352	688	(1.96 : 1)
Mode 15	1215	500	(2.43 : 1)
Mode 21	657	267	(2.46 : 1)

Alternative speed test

To get, perhaps, a more realistic gauge of the speed of the drives and interfaces, I tried a different speed test in which I copied a complete Shareware disc into a directory (DirOne) on the SCSI drive, created a new directory (DirTwo) and then wrote a little program which copied the contents of DirOne into DirTwo:

```
TIME=0
*COPY $.DirOne.* $.DirTwo.* ~CR
PRINT TIME
```

Unfortunately, it revealed a bug in the Lingenuity software such that it crashed the hard disc with a Bad FS map! This bug has now been fixed and Lingenuity are sending out new versions of the system software to all registered purchasers. This shows the importance of filling in those registration forms. If you haven't registered yet, don't say we didn't warn you!

(Stop press: We have just received a copy of the new software but haven't had time to repeat the tests. If we do so before the Archive price list has to go to the printers, we will put the results on the back page.)

Other points of comparison

What other differences apart from the prices have we noticed?

Documentation

Both companies have been sending out their drives with documentation which was, to say the least, inadequate. However, as we indicated in the Comment Column last month, Oak have got their act together and are now producing quite reasonable documentation – a 45-page A5 laser-printed manual and a ReadMe file on the disc itself relating to the use of the PC emulator. This information about using the PC emulator was not put in the manual, Oak say, because with the latest versions of the PC emulator (1.33 onwards) you get software to allow you to partition the SCSI drives without any hassle.

Lingenuity have accepted the criticisms about their documentation and are working on an improved version which may well be ready by the time you read this.

Getting started

This may only be a small point, but in order to get the Lingenuity drives started, you have to type *DEVICES to find out the device number of your SCSI drive and then type, say, *CONFIGURE SCSIFSLink 4 00 and then type *CONFIGURE SCSIFSDirCache 8K. Pressing <ctrl-break> then gives you a SCSI icon on the icon bar. With the Oak drive, you plug in the podule and drive, switch on and there, on the desktop, is a SCSI icon and away you go.

Then with the Lingenuity drives, it took time when you first mounted the drive after switch-on or <ctrl-break>. When you click on the Oak SCSI icon, the catalogue appears instantaneously whereas the Lingenuity drives take almost 2 seconds to display the catalogue. This does not make a lot of difference in practice since you don't often mount the drive.

Activity light

All manufacturers' external drives have an activity light so that you can see when the drive is being accessed but the activity light on the internal drives does not come in the right place to be seen through the hole in the front of the computer. Oak have got round the problem by adding another LED on a flexible cable. This new LED can be stuck inside the front fascia so it is visible from outside. It can be seen through the existing opaque label but to make it even more clearly visible, Oak have provided a new sticky label which has a transparent area over the mounting hole for the LED.

A3000 upgrades

If you own an A3000 computer, the decision as to which SCSI drive to buy is somewhat more complicated. For the A3000, Lingenuity have created a mini-podule version of their SCSI interface whereas Oak supply exactly the same podule as for the A310. The Lingenuity mini-podule is electrically identical to the A310 podule – it is just a different shape so it will fit inside the computer.

The Oak podule plugs into the expansion slot on the back of the computer and is provided with a strong metal case which bolts onto the back of the computer. This means that the computer is another 6 inches deeper but if you are using the Acorn monitor plynth, it does not make any practical difference as the monitor on the plynth goes back further than that.

Since the podules are electrically the same, and the same software is used, the speed differences are the same and all the comments above apply apart that since all are external drives, they have an activity light fitted.

Prices

Here is a list of prices (for Archive subscribers only) showing the types of drives used.

	Oak	Ling'ty	Drive
20M int	400	–	Seagate 28ms
20M int	–	410	Seagate 40ms
45M int	525	–	Seagate 28ms
45M int	–	545	Seagate 40ms
70M int	880	870	Rodime 18ms
100M int	1240	910	Rodime 18ms†
200M int	1620	1355	Rodime 18ms†
20M ext	560	–	Seagate 28ms
20M ext	–	505	Seagate 40ms
45M ext	655	–	Seagate 28ms
45M ext	–	640	Seagate 40ms
70M ext	1020	965	Rodime 18ms
90M ext	1210	–	CDC Wren 14ms
100M ext	–	1005	Rodime 18ms
135M ext	1570	–	CDC Wren 14ms
170M ext	1780	–	CDC Wren 14ms
330M ext	2340	–	CDC Wren 14ms
Std podule	220	220	
Mini podule		–	165

Using BBC hard discs

Phil Spur from Oak Computers has very kindly written an article explaining how to link up a BBC hard disc to an Archimedes using their SCSI card so this should save some of you a bit of cash. (See next page.)

Other SCSI podules

The Acorn SCSI podules are now available at £299 + VAT (£320 through Archive). We are trying to get hold of one for test and will publish the results in due course. *(Stop Press – we've got one! Slight problem – it won't work on the Archimedes, only on the R140! They are waiting for some software to be written to provide the necessary drivers!)*

The Computerware SCSI podules are nearing completion but not actually available yet. They are, however, selling SCSI drives on their own which could be used with any of the existing SCSI podules.

†Note that it is possible to run a Computerware SCSI drive (100M @ £790 or 200M @ £1230) from an Oak podule (£220). So you would pay £1010 or £1450 instead of the all-Oak prices of £1240 or £1620. Since the Computerware drives are exactly the same model (Rodime 18ms), you would get an equivalent system for somewhat less. A

Using BBC Hard Drives

Phil Spur, Oak Computers Ltd

A question frequently asked these days is 'Can I run my old BBC winchester drive on my Archimedes in native mode using the Oak SCSI card?' The answer in most cases is 'YES'!

Winchester drives on the BBC fall into three main categories. All three have in common the 'Host Adaptor' – a small circuit board which connects at one side to the 1MHz bus via a 34 way cable and to a 'SCSI like' bus at the other side via a 50 way cable. Before looking inside your winchester case to see what type of drive you have, make sure you disconnect the unit from the mains. The three main categories of drive are:

SASI

e.g. Xebec Owl. These drives connect directly to the host adaptor without any intervening circuitry. The 50 way connector on the drive is normally of the card edge variety. If you are unfortunate enough to have this type of drive, read no further. You will have to devise your own interface if you want to get it running on the Archimedes in native mode. Luckily only a small pecentage of BBC winchesters fall into this category!

SCSI

e.g. Seagate ST225N as fitted to Oak 20Mb SCSI BBC winnies and others. Again these drives connect directly to the host adaptor, but this time the connector on the drive is a 50 way IDC type connector (i.e. a 50 way version of the 1MHz bus connector). If your drive falls into this category, you are in luck, as these are the easiest ones to connect to the Oak SCSI card.

ST506

e.g. Seagate ST225 as fitted to Oak 20Mb ST506 BBC winnies and most others. These drives have an additional circuit board between the host adaptor and the winchester itself. This additional card has a 50 way IDC pin header at one side and a 34 way card edge and two 20 way IDC pin headers at the other side. The card will either be manufactured by Adaptec or Xebec. If you have a 400 series machine, you can plug the drive directly into the main PCB, otherwise, drives of this type may be connected to the Oak SCSI card but the process is a little more involved than with SCSI drives. Problems may also occur with older versions of the firmware on the Adaptec or Xebec card, but in general, if it worked on the Beeb, it should work on the Archimedes. If there is no separate power lead from the power supply to the host adaptor, check for rogue wire links on the Adaptec or Xebec card from a power line to a spare pin on the 50 way SCSI connector – if a rogue link exists remove it!

Connecting drives to the Archimedes

Having established the type of drive, you will need to procure a 50 way ribbon cable terminated with IDC connectors, approximately 1m long (available from Oak at £9.00 + VAT).

SCSI Drives

Carefully remove the host adaptor card, disconnecting the 34 way, 50 way and power cables. Tape up the host adaptor's power cable and secure it safely away from the fan. Using the 1m 50 way cable, connect the winchester drive to the Oak SCSI card in the Archimedes, making sure that the polarising bumps mate correctly. Now move to the section below headed 'Software Initialisation'.

ST506 Drives

To connect this type of drive to the Archimedes via the Oak SCSI card, it must already have been formatted on the BBC (this will usually be the case!) so that the Adaptec (or Xebec) card 'knows' about the Shape and Defect list of the drive. (This could be done with low level software on the Archimedes if anyone wants to write it!) Remove the host adaptor card from the formatted winchester, disconnecting the 34 way, 50 way and power cables. Tape up the host adaptor's power cable and secure it safely away from the fan. Using the 1m 50 way cable, connect the Oak SCSI card in the Archimedes to the 50 way pin header on the Adaptec (or Xebec) card, making sure that the polarising bump mates correctly at the Oak SCSI card end and that pin one on the Adaptec card is next to the stripe on the ribbon cable.

Software Initialisation

Power up the drive and the Archimedes and run SCSIFORM. Wait approximately 20 seconds for the drive to come fully up to speed and select the 'Scan SCSI Devices' option. This option will report back if it can see your drive and will give its SCSI Id number – an Adaptec or Xebec card will report back 'not a winchester disc (device code 48)' – this is normal so don't worry. (Note that if you have 2 drives connected to an Adaptec or Xebec card, they are referred to as Logical Unit Number (LUN) 0 and 1.) Use the 'Add Drive' option to add the drive as SCSI Drive 4 (or 5, 6 or 7 if you already have other SCSI drives fitted), then select the 'Initialise Map & Root' option. You should then have a fully functioning winchester drive. The best way to test the drive is to use it from the desktop. If you have any problems or need additional information, give Oak a ring (number on inside back cover of the magazine). A

Hardware Column

Brian Cowan

I must apologise to followers of this column for its non-appearance for the last few issues, particularly, since you gave the Hardware Column such a resounding "thumbs up" in the recent survey. My day-time job (it also seems to be my night job too!) is as a lecturer in physics at London University's Royal Holloway and Bedford New College, and last term was sufficiently hectic that I was able to don very few of my other hats.

Mach-inations

Perhaps the most significant thing that has happened of late is the demise of Mach Technology. Fortunately, I was not one of those who got stung, having sent off only official orders to them. However it is clear that Paul B's advice to readers about not parting with any cash until the firm actually came up with some products must have saved many readers from grief. *(Reports in Micro User say that Mach Technology owed £53,726 and had assets of £1,768, so that there is not much hope of anyone getting their money back. Ed.)*

I had quite a few telephone conversations with people at Mach and on the whole I was quite impressed with their ideas and plans for the future. One incident, though, struck me as being rather strange. Some time near the expected "release" of their '286 board I was discussing with a Mach engineer some aspects of the Archimedes circuit. He expressed surprise that I had seen the circuit diagram, and then proceeded to ask me various questions about the machine's inner workings. However that was nothing to my surprise that a company engaged in building sophisticated hardware for a computer did not even possess a circuit diagram of that computer. On the other hand, I still believe that they did have a '286 card almost ready to send out – there was one account on the Archive BBS of someone who had actually seen a prototype in operation.

(I may be cynical, but anyone can log onto Archive BBS, call themselves any name under the sun and make whatever claims they like – FRG's meet the real world here! Ed.)

Any other '286 boards?

I can't be the only person thoroughly disappointed at not getting a '286 board for my Archimedes. I was therefore delighted to read in the November issue of Archive, John Krakenburg writing that "Many companies are working on 286 boards...." If this means '286 add-ons for the Archimedes then I would like to know more. I think that with Mach's low price, other firms probably cried off such a project, so now things may have changed. Does anyone know of any other companies working on a DOS card for the Archimedes?

I know I have said this before but, at the risk of boring you, I will repeat my proposal for a solution to the DOS problem. What we want is a Tube implemented for the Archimedes just as on the old beebs. With a Tube podule you could plug in the Acorn 512 card (it contains an 80186 processor) and run DOS-plus. Then other companies might be persuaded to come up with '286 or even '386 second processors which could then also be used on the old beebs as well.

The point about this is that it breaks the project down into smaller units. Design of the hardware for

an Archimedes Tube podule is easy – even I could do that. Writing the host machine Tube software should be easy for someone (but unfortunately not for me). Come on then all you budding programmers out there, there must be someone who could write the code. Much information needed concerning the Tube protocols is contained in the newer BBC Advanced Users Guide and in volume three (published by Watford) of the Master Reference Manual.

Up Acorn's sleeve

In that same article, John Krakenburg was speculating about Acorn's short term future. The privilege of being taken into Acorn's confidence is accompanied by the responsibility of keeping those confidences. For this reason some things I know about I can't write about. However I can still speculate on topics where the information has not been obtained from Acorn and where I am not breaking a confidence. Of course I am as free as the next person to put two and two together to make twenty three! So here goes...

UNIX

The R140 UNIX box is being offered to various potential customers at very attractive discounts. *(You can buy an R140 with a Taxan 770 multi-sync or a 19" mono monitor and an Ethernet card for £2999 + VAT but not through Archive! Ed.)* Users of UNIX will know that it, and particularly X-windows, is rather memory-hungry and not terribly happy working with 'only' four megabytes of RAM. Putting these two facts together I would infer that Acorn are clearing their stocks of R140s prior to introducing a new UNIX machine containing two MEMC1b controllers, supporting up to eight megs of RAM. Remember that this memory controller can operate in master/slave mode so that in fact you can have as much RAM (up to the ARM addressing limit) as you want, each four megs having its own MEMC.

The question then is what CPU the machine will have. Since the ARM3 is now in production, I would go for that one. There can't be any point in Acorn not using the latest available technology (although we all know that that is precisely what the IBM/Intel cartel would do). Also, the general rule of thumb is that each MIPS (million instructions per second) requires a megabyte of RAM to keep it running smoothly. Thus our old ARM2, rated at four MIPS runs happily with four megabytes, but the eight MIPS ARM3 would need eight megabytes to keep it happy.

If all this is no more than idle speculation then we might see Acorn selling off "empty" R140 machines without the UNIX, that is 440 machines with 50 megabyte Winchesters. Remember though that the hardware of a 440 can be bought from Paul as an upgraded 410 at only £1895 + VAT (including £100 of free software) or less for education. *(And a free Acorn colour monitor in this month's special offer – while stocks last! Ed.)*

DOS

John mentioned the possibility of machines with hardware DOS capability, having an on-board '286 or '386 CPU. This is the option adopted by the SUN 68000 UNIX workstations. On those machines you run DOS essentially from within UNIX. This contrasts with the R140 where you have to quit from UNIX to RISC-OS and then run the PC emulator. I am sure that adequate DOS support is vital for the future of Acorn, although I sympathise with them for not wishing to be seen running after such an inferior product.

I really don't think that there can be any serious future in a software emulation of DOS, even though I understand that a completely new version of the PC emulator is currently under development at Acorn, scheduled for release sometime this year. I assume that the improvements would relate to improved coding to exploit the RAM cache of the ARM3 and possibly some more screen emulations: VGA/EGA, although these are rather CPU-intensive.

The tail wagging the dog

If Acorn's UNIX market takes off then Archimedes devotees will be no more than the tail on the dog, with no clout in the market. Assuming the podule remains the expansion route for the ARM machines then we will have to be content to ride on the backs of the UNIX users. We have already seen this in the floating point coprocessor and the Ethernet podules, both of which are really aimed at this potentially larger user base. If it seems that the

UNIX users want good DOS support or even Macintosh (68000) emulation then something might happen and podules might appear.

New ARM family chips

ARM3 is now with us, so what next? I understand that there is an ARM4 on the drawing board – maybe this one will finally include the floating point instructions. On the question of floating point support, I understand that Acorn might be working on a dedicated FPU that implements the full floating point instruction set without software "help".

There are whispers about a MEMC2 chip which supports just oodles of RAM. Why, you might ask, does the MEMC1/MEMC1a support only four megs? The answer lies in the brilliance of Acorn's conception of what the ideal memory controller should do. Primarily it must supervise memory accesses and do things such as page switching. However to this list Acorn added RAM chip address decoding. This means that for most RAM configurations the RAM chips connect directly to the MEMC.

Unfortunately at the time of the design of the original MEMC there were none of the really large RAM chips (1 megabit and 4 megabit) that are now available. The old MEMC limit was dictated by how many of the then existing chips could realistically be driven from one controller. But since these new RAM chips are now with us (almost) a new MEMC can't be far away.

Next release of RISC-OS

If you look at the RISC-OS ROM sockets on the 400/1 machines you notice two interesting things. Firstly the sockets are bigger than the chips. There is nothing new in that, since the 300 machines also had oversized ROM sockets which potentially could support chips with more pins. What is interesting about the sockets on the 400/1 machines is that there is an extra address line connected to them so that a one megabyte set of ROMs could be accommodated. It does not take much of a leap of imagination to speculate that the next release of RISC-OS may well break the half megabyte barrier. I know that there were some things that Acorn, reluctantly, had to leave out of the RISC-OS ROMs because of lack of space.

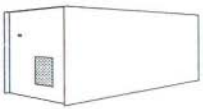
I would like to dispel the idea suggested by our editor in the October issue of Archive that RISC-OS version two will have a new version of BASIC which "will support full floating point variables", that is it will implement its floating point operations via the floating point emulator/podule. Now I know that such a version of BASIC is under development, which handles all floating point variables in double precision: eight bytes rather than the BBC BASIC standard of five bytes. However this is much slower than Roger Wilson's superbly coded and optimized floating point implementation in the BASIC ROM.

My guess is that there may be a newer versions of BASIC V in any new release of RISC-OS and that it will continue to use its own internal floating point support. An extended precision version of BASIC, possibly called BASIC VI, and using the external floating point support may well be sold as an extra for those who require such precision while working with BASIC.

Mac attack

Finally let's turn to the Macintosh computer. I am full of admiration for our editor who quite openly (blatantly?) continues to use Macs for the production of this magazine. It is no use shutting one's eyes to what is out there in the non-Archimedes world. Unfortunately the software (and sometimes the hardware) is still not there. I recently telephoned a company to ask them about an Archimedes software product they had developed. There is a superb package for the Mac which does the same sort of thing. When I asked this company how their product compared with the Mac package the answer was "Well actually I have not tried it, we only have Archimedes machines here". Need I say more?

At work I am being pressurized into using Macs for our DTP work. Most of our publications involve great chunks of mathematical formulae involving special symbols and Greek characters. These are not available in outline fonts and to the best of my knowledge Acorn still have not released the design tools to enable third parties to produce such character sets. It is quite galling for me, particularly since I have the reputation of being an Archimedes fanatic, to have to admit that we do need to use Macs for that purpose. Come on Acorn and get your act together. A



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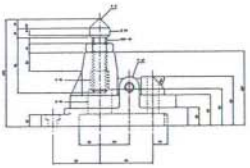

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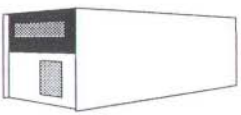

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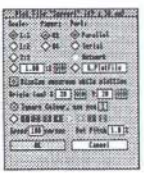

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Spark – RISC-OS File Compressor

Alan Glover

Spark (£5.99 by post from David Pilling) is a development of the Archimedes 'Arc' program. So, before progressing to the advantages offered by Spark let us take a look at Arc.

Arc File Compresser

Arc is a program intended for archiving and recovering files. It can put a number of files into one file, and will compact/crunch the files. It can achieve some impressive savings – around 50% on text files and often much more with files such as sprites or screendumps. Although intended originally as an archiving aid, it has found a secondary use – as a means of linking files together on bulletin boards so that users can download all the files for a particular program in one file, with the benefits of file compaction too. Arc is 'public domain', i.e. it is freely distributed and appears on a number of discs and virtually all Archimedes bulletin boards.

Arc does have a number of problems though: it does not easily handle directories, and is only controllable by a *command with a vast number of possible parameters.

Arc to Spark

Spark has been written by David Pilling, who converted the Arc program, to rectify these and a number of other shortcomings in the original program. It differs from Arc in that it runs in the RISC-OS desktop. Once loaded, it installs itself onto the icon bar. Henceforth double-clicking on a file with the 'ark' icon (filetype &DDC – used by Arc V1.2 as well), or dragging any file to the icon, will open up a window on screen showing the files in the archive. This is in a display just like the normal filer window. In fact, wherever possible, it behaves just like a filer window, such as ADFS or RAMFS.

Directories can be handled by Spark too. Files and directories can be dragged into and out of a Spark window, almost as if compaction/archiving were not involved. The practical effect of this is that to access a file in an archive you do not need to unpack the whole archive. Thus you could have well over 1 Mbyte of data on a disc and simply access whichever files you need. This should lead to impressive space savings on things like pictures/line art for use with the ever increasing number of DTP packages for the Archimedes.

Despite the vastly easier to use interface, none of the power has been lost and all the options of the old Arc are still there, accessible by means of menus from the file window or the icon.

I have been using Spark for some time now preparing and testing files for the Archive Bulletin Board. I find that its ability to handle directories is worth the package alone (one of the things I least enjoyed [and most often messed up] was flattening out directory structures to prepare files for the board). It has one or two quirks, some of which are inherited from Arc but these are soon discovered and avoided.

Incidentally Spark and Arc files are interchangeable. A multi-directory archive made with Spark can be decoded with Arc, but it must be invoked for every directory. You may also get crc warnings when using Arc on Spark images – these should be ignored.

More for your money

However, there is even more on the Spark disc. There is another non-pd program called Backdrop. This allows you to leave a file or directory anywhere on the background of the desktop (like TinyDirs) but you can leave files anywhere on the screen.

There are also a number of public domain programs included. The first is a 'Dustbin' program. This allows you to delete files by moving them into the dustbin, whereupon the bin bulges. You may then either drag the files back into a directory or empty the bin, which deletes the file.

'Format' is a background disc formatter for ADFS discs. It multi-tasks with other applications (although it does take a fair bit of processor time). I have even used it to format discs in two different drives simultaneously!

'Wander' is one version of the now (in)famous RISC-OS desktop fish program – a number of fish appear behind a window, whose presence is only betrayed by a stream of bubbles rising from behind the window! A

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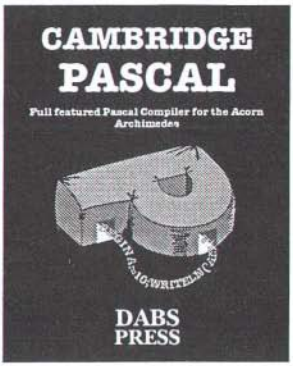

Cambridge Pascal is a comprehensive version of the Pascal language and includes many extra enhancing features over the standard specification including full dynamic string handling, local error handling, random access files, direct access to 'star' commands and RISC OS SWI calls. It is 100% Desktop compatible but can also be run from the command line. All programs compile into fast, efficient machine code.

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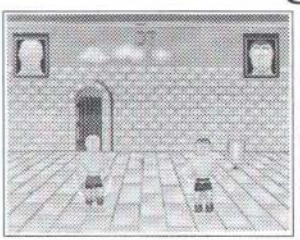

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BASIC V Forum

Clifford Hoggarth

Recursion – My dictionary defines the verb, "to recur" as, "to happen again and again". In computer programming, recursion is usually more precisely defined as a program subroutine which calls itself, i.e. it is called again and again, before the subroutine finally exits.

A simple example illustrates this property: consider the implementation of a function to calculate the factorial of a number. Now the factorial of an integer n is defined by the equation:

```
n! = 1 * 2 * 3 * ..... * (n-2) *
     (n-1) * n
```

Hence a recursive function can be written:

```
DEF FNfactorial(n)
IF n=1 THEN
  =1
ELSE
  =n*FNfactorial(n-1)
ENDIF
```

Consider the following call to this function:

```
result=FNfactorial(3)
```

this first becomes

```
=3*FNfactorial(2)
```

and then

```
=3*2*FNfactorial(1)
```

and as FNfactorial is defined as being 1, the final outcome is

```
result=3*2*1
```

A recursive routine must have a means of reaching an exit, otherwise continuous recursive calls will result in all the available memory being used up. Another important consideration is that any variables used within the routine must be LOCAL variables – remember that any passed parameters are always local anyway. This introduces the concept of re-entrancy. A routine is said to be re-entrant if it can be called before the previous call has completed. This is mainly applicable to machine code routines to be used following interrupts, when the flow of the program is unpredictable. However, similarities can be drawn with recursive routines.

Binary Chop

This introduction to recursion (which I will return to in a later article) is a prelude to discussion following the binary chop routine in the November issue and the comment that "the best versions of this technique are usually recursive". Before we examine this statement we must take a look at coding the routine. Several people have sent in suggestions for recursive versions – to save space in the magazine these are on this month's program disc if you want to compare the different methods of implementing the same algorithm.

The examples below assume the data is ordered and in an array M$(), with the lowest index used being 1 (i.e. M$(0) is not used).

Here is one recursive implementation of a binary chop routine.

Call with result=FNchop(1,n+1,search$)

```
DEF FNchop(a,b,f$)
LOCAL r
r=(a+b+1)DIV2
IF r<>b THEN
  CASE TRUE OF
    WHEN f$<M$(r) :r=FNchop(a,r,f$)
    WHEN f$>M$(r) :r=FNchop(r,b,f$)
  ENDCASE
ENDIF
=r
```

It works by calculating the mid-point of the two limits of the search and then repeats the search on whichever half the desired item is to be found, replacing one of the limits with r. The routine exits under one of two conditions, either the item is found, or the range of items is reduced to a point where the range cannot be made smaller (at which time r=b, the upper limit).

The +1 in the equation for the calculation of r requires the use of initial limits of 1 and n+1. If the +1 is not used then limits of 0 and n should be used. The routine works in exactly the same way whichever are used but the latter will take one extra call of the routine if the search value is less than the lowest value in the array.

It is necessary to use an initial range one greater than the size of the array in order to correctly detect values outside the array values.

Note the use of the CASE statement. This will match with the first WHEN statement which evaluates to the value TRUE (i.e. -1) and is useful in situations when only one test can be true – the alternative is multiple IF statements. The advantage of the CASE statement is that once one WHEN statement has been executed, upon returning from the function call, the program will continue execution at the ENDCASE statement. With multiple IF statements, any following IF statements will be executed, which could possibly cause a problem.

Now to the question of recursion being better. It is true to say it is more elegant, and often clearer to anyone reading the code, however it is not necessarily faster. This is demonstrated by the following program which is a non-recursive binary chop coded for speed. (Call by using result=FNbc(0,n+1,search$))

```
DEF FNbc(a,b,f$)
REPEAT
  r=(a+b+1)DIV2
  IF f$<M$(r) THEN b=r ELSE a=r
UNTIL b-a=1 OR f$=M$(r)
=r
```

(Note the original limits must be 0 and n+1). The times in seconds for searching for every item array minus the time for 1000 repeats are as follows:

	n=10	n=100
Recursive	36.15	581.58
Non-recursive	25.95	392.24
Ratio	1.48	1.39

These values show that the non-recursive routine is faster than the recursive one. These test routines are only searching small arrays and the overhead of the recursive routines will increase as the array size increases and a larger number of calls is required for a search. This can be seen by the increase in the ratio between the times.

A further consideration is that each recursive call uses up memory, and a high number of recursive calls can lead to memory problems.

This may sound very "anti-recursion", but is not meant to be. Recursive routines can be the ideal solution to many programming problems and are sometimes the only way. However there are many situations were recursion is not the best method for various reasons, and you should be careful not to fall into a trap of assuming, "It must be good – it's recursive".

Scroll/Noscroll

Thanks to those of you who wrote in about this, though as you probably read in the last article, I had discovered the truth about the "bug". This is a good example of how public discussion can help resolve such items – no-one can know every aspect of programming the Archimedes. Please keep writing in with your comments. A

Genesis – Musical Animated Database?

Doug Weller

Having had a look at a pre-release version of Genesis, here are some first impressions:

Genesis makes possible the creation of databases containing text, graphics or music (from !Maestro). A Genesis database is called an Application and consists of a series of RISC-OS windows (pages) which can be linked together in any way.

Creating Genesis applications

Genesis pages are created by clicking on the Genesis icon on the icon bar. You then create resizable frames on the page and can type in text, import files from !Draw, Euclid or Mogul, etc (thus you can have animated graphics), sprites from any of the standard Archimedes art programs, or music files from !Maestro. Maestro files can be played by clicking on them thanks to the built in Maestro driver. Pages can easily be linked to other pages.

Searching your application

The final version of Genesis will also have a FIND option, which will allow the application to be searched for any word. As page by page searching could be slow, a keyword index facility will be provided. It will be possible to ask Genesis simply

to open the first page found or to display all the pages as miniature icons with their page names in a RISC-OS window similar to a directory window.

Sound sampling?

Another facility being considered is a module to play back sampled sounds though this may not be available in the first release version. (Imagine a database of birds with sampled bird calls!).

Examples

Two example files on my demonstration disc illustrate the potential. One has as its first page a map of Europe. Clicking on a country takes you to a page with detail about that country, including its flag and a Maestro icon which plays the national anthem.

The second file is an example of what children could create for a local study project. It consists of a map of a village imported from !Draw, showing the pub, post office, etc. Clicking on any of these then takes you to other pages offering more detail.

Pros and cons

Genesis is seen as providing pupils with the opportunity to create their own databases for project work, etc. It would also be ideal for the creation by children of branching adventure games. It has the benefits of allowing the inclusion of graphics, animation and sound. It has no calculation facilities however and will not produce graphs. Thus it complements existing database programs but does not replace them.

Genesis is multi-tasking which is an important advantage.

I can see that it could be used to create and run programmed learning systems.

Conclusion

I'll need to see the final release version being used by children before I can decide how useful it will be in schools. My hunch is that it will be used a lot in secondary schools, where they can afford to buy it more easily and also have access to – and the ability to use – programs such as Euclid (and secondary children are much more able to use programs such as DRAW and MAESTRO). Having said that, I'm very impressed and hope that lots of people buy it and write applications for me to play with!

The bottom line

This pre-review was written from my experience with a demonstration disc. By the time you read it, Genesis should be obtainable from Software Solutions, at £69.95 for educational purchasers and £86.95 for others, both prices ex VAT. A

Matters Arising

• **!BigM problems** – Stephen Gaynor discovered a rather serious bug in the 256-colour art package on Shareware 16. It will not load or save screens! The problem arises because the program attempts to jump to non-existent program lines 2850 and 3120. Therefore, in order to solve this problem, you should add the respective lines to the 'TekenV5' program in the '$.!BigM' directory. Alternatively, you can obtain a free upgrade by returning your original disc to us.

• **Cambridge International Software's Spring Fair** – CIS will be holding an Archimedes specific Spring Fair at its headquarters of 8 Herbrand St, London, WC1 on March 10th – 11th. As far as the organisers are concerned, the fair is a non-profit making venture with the aim of bringing as many Archimedes products together as possible. Micro User will be sponsoring the event which also has the blessing and support of Acorn. The exhibition will not be an "Earls Court" but it does hope to achieve the success of the Watford Electronics' Open Days with about ten times more space. The exhibition times are 10 – 6 . on Saturday and 10 – 5 on Sunday.

• **!PCDir version 0.9h** – Keith Sloan has sent us an update to his excellent desktop MS-DOS disc read/write utility. The program will read/write 720k format 5.25" and 3.5" MS-DOS discs and access PC Emulator hard disc partitions. The program is available on Careware 4 – existing owners can obtain a free upgrade by returning their original disc to us. (The trouble is the new version is bigger than the old one and had to be compacted to get it on the disc, but !SparkPlug is also on the disc which is all you need to get the files uncompacted.) A

Language Column

David Wild

As this is the first language column of 1990 I would like to wish you all a happy new year, and hope that you all get a great deal of both value and pleasure from using your Archimedes. There can be no doubt that one of the requirements for doing good work is that you enjoy doing it.

Later in this column you will find a review of Cambridge Pascal from Dabs Press. I did ask David Atherton why they had not called it "Manchester Pascal", but he didn't answer that! I will also be talking about an interesting book about mathematical graphics using Pascal, although much of it relates just as well to BASIC or C with a little translation work.

Error handling

Recently I had a couple of messages from a gentleman who complained about the lack of error handling in Pascal. His complaints were about a program crashing when he asked it to print 1/0, and about the program not inserting an end-of-file marker when the file came to an end without. Cambridge Pascal provides error handling routines which would give some help on the first of these at least, but I feel that any program to be used by other people, especially those who are not computer enthusiasts, should do all its own error handling anyway.

This is not because the error handling routines don't work but because they usually come into operation too late to be helpful and because a general error handler doesn't allow you to provide messages which are relevant to the particular problem. A system-provided error handler will also miss problems which do not cause potential crashes but which are wrong in context.

You may, for instance, wish to calculate miles-per-gallon statistics for vehicles in a fleet. The arithmetic is miles divided by gallons and this would crash if the gallons were to be zero. The calculation is equally nonsense, however, if the gallons figure is not zero but the miles figure is. In either case, it is probably sensible to provide some figure, such as a negative number, and then write your routines for the fleet as a whole to ignore both the miles and the gallons for this vehicle and to omit it from the count of vehicles if an overall average for the fleet is needed.

You will also find that most users are very bad at quoting error messages which are not expressed in user terms. When they go to use the computer they are thinking about "Sales figures" or "Budget" rather than computers, and so a message which says "divide by zero" doesn't make a lot of sense.

Error handling may have a very useful role while you are developing your program but, by the time it is ready for release, the only messages which should reach users from the computer system are those relating to such things as disk errors, which your program cannot trap.

Cambridge Pascal – first impressions

Just before Christmas a package dropped through the letter box – a review copy of Cambridge Pascal. Naturally, I loaded it on to the Archimedes and started to look at it. There was an application called !Pascal together with some example files to show what it could do.

I clicked twice on the icon and a small copy of it went on to the icon bar. I opened the examples directory and then the graphics directory, dragged a file called "box" to the bar icon, a "saver" icon with a file called "object" appeared and I dragged this back to the directory viewer. Immediately a window opened and I saw a listing of the program scroll through it. When compilation had finished I was invited to click the mouse, and when I did so there was a file called "object" in the directory. I clicked on this file, the screen cleared and a wire frame box, with hidden lines removed cavorted all over the screen. I watched it, impressed, for a while and then thought that I would get back to the keyboard for a further look at the package. I pressed the spacebar, the return key, <escape> and <break>, none of which had any effect, and found that the only way to recover control was to reboot.

This contrast between impressive features and frustration showed more and more as I investigated further. Although compilation is effected by

dragging a file on to the icon bar, the compiler is not multi-tasking, and everything else stops while compilation takes place. Equally frustrating is the fact that only one of the example programs pays any attention to RISC-OS. While this may not matter much with many of the programs, which are all small, it means that there is no guidance for writing programs which are intended to multi-task.

Documentation

The manual itself, only 58 A5 pages long, has no reference at all to WIMP programming. There is some help, in a subdirectory called 'wimp', with an example program. Unfortunately this program tries to show everything at once, while not actually doing anything, and so makes it very difficult to see how to adapt the techniques to your own programs.

The wimp program has some comments, but only in parts, and contains several empty procedures which are called by the procedure invoked by Wimp_Poll. It also contains six integers which are declared for use in menus. Only five of them are used, but one is used twice for two different menus. Further difficulty was caused when I tried to adapt the program to do something else by the programmer having declared a variable called 'write', so stopping the use of the standard 'write' procedure.

All the specifically wimp related procedures and functions are contained in two files which are $included in the main program and which contain absolutely no comments. As one of the major advantages of a compiled language is that there is no run-time penalty for comments, this seems particularly unfortunate.

More help with wimp methods would have been very welcome in converting one of the 'benchmark' programs where all the real work is done in a function which is only called once. Presumably Wimp_poll should be called from every point in a program where significant loops exist, but we get no guidance.

Some of the other example programs showed evidence of hurried work giving rise to errors. One program which, according to a comment at the start, was designed to illustrate the use of $include contained no include statements at all! Two other programs in the same directory contained exactly the same comment at the start while actually doing different jobs. In a directory purporting to contain files for inclusion there were several very trivial program fragments, presumably for inclusion in the program without the $include examples.

There are other failures in documentation. Included in the package are two libraries which need to be loaded before any program using language extensions will run. They are loaded automatically when you initiate the compiler, but are not mentioned anywhere in the manual. In an example application on the disk, one of the library names is misspelled in the !run file, so giving rise to a run-time error. For any compiled program to be distributed it will be necessary to include these libraries, but there is no indication that you have any right to do this. This means, in practice, that all distributed programs will need to be sent out as applications. (Although there is the usual copyright notice about the manual there is nothing at all about the programs themselves, or anything asking you to acknowledge the use of the compiler in any programs that you distribute.)

What of the compiler itself?

All the criticisms so far relate to the manual and the supporting programs. The compiler itself seems to be fast and produces reasonably fast running programs. Although a listing appears in a window (non-RISC-OS) on the screen there doesn't seem to be any way of diverting the listing to a file or the printer. This listing doesn't give any indication of which lines are taken from $included files.

The only 'bug' I have found is that some errors cause the compiler to go into an endless loop reporting the same error all the time, although the manual says that it should go on to check the rest of the program or terminate. This bug isn't serious because you can always press the <escape> key and do any necessary editing.

In addition to all standard Pascal, with the exception of conformant array parameters, Cambridge Pascal provides a large array of extensions. These cover graphics, giving much the same facilities as BASIC, strings, local error handling, operating system access including a very useful SWI procedure, random file handling and random numbers. Two useful string procedures cover the conversion of strings to and from real numbers – but

I feel that the names 'writestring', which converts a number to a string, and 'readstring' are slightly confusing.

Six functions provide the addresses of the start and end of the object code, the start and end of the heap, the stackpointer and the end of the stack. Oddly enough, there is no way to find the address of a variable – although this could be useful in connection with some of the SWI's. To cover this you have to declare a variable using a pointer.

There are facilities for producing application, utility and service modules although these will allow only one command to a module. There is no equivalent of the separately compiled modules as provided by Acorn's Pascal and I felt the lack of this watching the large $include files of the wimp example go up my screen for the umpteenth time.

Another potentially useful facility it has is conditional compilation, although the example shown in the manual does not illustrate its use very well.

When I read the manual, I did find out how to make my programs respond to the <escape> key, but the easy way of doing this also gets rid of several other types of checking as well and, in large programs, you will need to insert them explicitly. It might be a good idea if a later release changed matters so that the <escape> facility had to be specifically disabled for those occasions where it is essential to do so.

This review has seemed to be very negative and it is unfortunate that it has turned out that way. If the manual and example programs had been good enough, I could have been enthusiastic about Cambridge Pascal. While I am prepared to work hard to learn a language I resent being forced to do a lot of work to find out things I ought to be able to look up in the manual. In its present state the package is certainly not worth nearly £80. Even with a good manual and other information it will not replace Acorn's version because of certain acknowledged deficiencies which would stop it securing BSI validation but it would be a useful, cheaper alternative.

Experimental mathematics

Anyone with even a vague interest in mathematics has probably run Mandelbrot Set or other fractal design programs.

I recently came across a book, "Dynamical systems and fractals" by Becker and Doerfler and published by Cambridge University Press at £10.95. It is full of example Pascal programs, which could be translated into C or BASIC without much difficulty. By the time you have worked your way through this book you should understand a great deal more about the mathematics of chaos and generated many beautiful pictures. Sometimes it is a bit of a struggle to understand exactly what input is required and I suspect that some clarity has been lost in translation but the effort is well worth while. A

Mathematical Applications

Brian Cowan

In last month's magazine there was a short note in the Help!!!! section stating that I was trying to compile a shareware disc with mathematical programs/applications on it. So far I have had a reply from D Fagandini offering a program which determines recurring decimals over any range of numerators and denominators. I am hoping for some others.

In this article I want to outline the sort of programs which I would like to include on such a disc and then I will discuss an interesting mathematical problem that I have recently been working on. Hopefully this might stimulate some of our readers to devise better/faster solutions. Maybe this will become the first of an occasional column on number-related problems.

I am particularly interested in working within the confines of BASIC (including possibly assembler) to compile a library of mathematical functions and procedures. A previous shareware disc contained a set of matrix routines and these might well be included. I have already written some functions for the evaluation of elliptic integrals and I would like to do the same for such things as the gamma function.

I have some fast Fourier transform programs in BASIC and BASIC/assembler, although these need to be tidied up somewhat before being suitable for publication. Also, I have written a numerical

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integration program which provides its answer to a pre-defined accuracy. This might form the basis of a future article since I am sure it could be improved and speeded up.

Prime numbers

This month I would like to look at some questions concerning prime numbers. In particular I want to concentrate on the question of finding the Nth prime number; for instance what is the hundredth prime number, or even the millionth? This problem actually arose in some work I was recently doing but it would take me too long to explain how!

Anyway, I was looking through some books and I found something very interesting in the book on Mathematica by Steve Wolfram. I have mentioned Mathematica before: it is an all-singing all-dancing computer algebra/mathematical graphics program available on the Mac, the NEXT workstation and possibly shortly on the Acorn UNIX machines. In that book I learned that Mathematica has a fast way to find the Nth prime. As an example they quote the millionth prime as being 15485863. Well, I reasoned, if Mathematica can do it then the Archimedes can do it better. Or so I thought.

I set about writing the following program, the main part of which is the function FNprime(N%) which returns the N%th prime, as required. The earlier lines of the program are simply to test out the function.

```
 10 REPEAT
 20   INPUT "NUMBER ? " M%
 30   TIME =0
 40   PRINT M%;"  "FNprime(M%)
 50   PRINT TIME;"  CENTISECONDS"
 60 UNTIL FALSE
 70 END
 80 :
 90 :
100 :
110 DEF FNprime(N%)
120 :
130 REM FNprime(N%) returns the
    N%th prime number
140 :
150 LOCAL P%(), TEST%, B%, S%
160 DIM P%(N%)
170 IF N% = 1 THEN =2
180 P%(1) = 2
190 IF N% = 2 THEN =3
200 P%(2) = 3
210 FOR A% = 3 TO N%
220   TEST% = P%(A%-1)
230   REPEAT
240     TEST% = TEST% + 2: S% =
                        SQR(TEST%)
250     B% = 1
260     REPEAT
270       B% = B% + 1
280     UNTIL (P%(B%)>S%) OR
            (TEST% MOD P%(B%) = 0)
290   UNTIL P%(B%)>S%
300   P%(A%) = TEST%
310 NEXT A%
320 =P%(N%)
```

In the usual sieve method of testing for primes you divide the test number by all odd numbers up to the square root of the test number. This can be time consuming, particularly when you need to test so many numbers. I argued that since you only need to divide by the primes less than the square root of the test number, then some speed-up was possible. Accordingly in looking for the Nth prime I declared an array P%() of N integer elements. This array stores the primes as they are found and at each stage we divide by the numbers found from this array.

The heart of the procedure is a pair of nested REPEAT UNTIL loops. The outer loop selects each new number to be tested for primality and the inner loop then performs the divisions needed for the test. Exit from the inner loop occurs either if division is successful, whereupon the number is not prime, or if all divisions are unsuccessful, when the number is proven prime. The second loop is exited when the number is found prime and the process then starts all over again for the next test number.

The program works reasonably well, being quite fast for moderate values of N. However it slows down for large N, and when I tried for the millionth prime, I was in for a shock. The computer told me that it did not have enough memory. Upon consideration this should have been no surprise. An integer is stored in four bytes. So an array of one million integers would need four megabytes of RAM. Now my machine had four megs of RAM, but that has to hold the program and all the other

variables as well. So this "fast" method will not cope with such large numbers.

Maybe I just need more RAM. Unfortunately this turns out not to be the case. You can run the program to find, say, the hundred thousandth prime and it goes quite merrily. I did not have the patience to wait for the answer. Extrapolating the various timings I have made it looks like it would take something like a week to find the millionth prime number! So much for my "fast" method. If anyone knows how to speed this up please let me know. I would dearly love to know what algorithm is used by Mathematica.

For those who are interested, here are a few possibilities. A modest improvement in the speed of the program can be had by replacing the REPEAT UNTIL loops by FOR NEXT loops where the exit is achieved by interfering with the loop variable. However real speed improvement could be had by using a look-up table containing perhaps every thousandth prime and using the sieve method from the nearest lower tabulated value. Any ideas? A

MultiStore versus Pipedream 3

Graham Hobson

This month I will be giving my initial impressions of MultiStore and how it relates as a database, compared to the facilities offered by PipeDream 3 and System Delta Plus.

The machine I am using for the review is an A310 with 1M of memory, an internal Oak SCSI 45MB Hard Disc and a NEC Multisync Monitor II. (The multisync will not be used for this review, although I consider the hard disc mandatory within the business environment).

A database can be thought of simply as an electronic 'box file' – where each card is a record and each item on the card is known as a field.

On a database, the idea is that you are able to hold records consisting of collections of similar pieces of information, e.g. names and addresses, stock records, credit accounts, bookings, pupil records, chemical data, patient information, etc. By making the database electronic you are able to search and/or sort the data far faster than any manual box file or system. Imagine dropping a thousand record cards down the stairs and then having to put them back in alphabetical order! This would obviously be much simpler if the data were on the computer, although you have **big** problems if you drop the computer down the stairs!

PipeDream 3

PipeDream3 was developed by Colton Software and is a multitasking package incorporating wordprocessing, spelling-checker (94,000 words), spreadsheet and database functions (with no joins). Only those facilities of PipeDream that relate to a database function will be considered in this review since earlier reviews have concentrated on Pipedream's other features.

On startup, PipeDream will present you with a blank spreadsheet screen, showing columns and rows. You can have a spreadsheet area of 8192 columns by over 500,000,000 rows – subject to memory limitations of course! Data is kept within the spreadsheet, by utilising the rows as records and the columns as fields. Records can be entered as single- or multi-row records. You could keep an address book with your data, with the fields going from left to right: NAME, ADDRESS1, ADDRESS2, ADDRESS3, POST CODE, TELEPHONE. By opening the column widths <ctrl-W> you can make it look presentable in order to be able to see the full field width.

The data can be sorted into order by marking the area and issuing the sort command <ctrl-BSO>, when a dialogue box appears and you are able to sort into ascending or descending order, on one or more fields at the time. A search command <ctrl-BSE> can be made to locate records. By using the '&' operator it is possible to print or save the various rows that match the criteria given.

You are supplied with several functions which operate upon a range of slots (your database) subject to the condition which forms their second parameter. They all have the form:

```
DFUNCTION(range,'condition')
```

There are only eight main database functions

(excluding numeric functions) within PipeDream and, although not complicated to use, they do require thought prior to their use: DMAX, DSUM, DCOUNTA, DVAR, DAVG, DSTD, DCOUNT, DMIN.

Pipedream allows a file to be completely or partly saved, by specifying either columns, rows or marked blocks. In addition, it is also possible to save in different file formats:

Pipedream	Pipedream's own format
CSV	comma separated values
TSV	tab separated values
DTP	DeskTop Publishing export
View	Pipedream is View's Archimedes successor (previously known as View Professional).

By saving your address book (either part of it, or in its entirety) into a Tab file (TSV) you are able to utilise this within a mail shot. A mail shot and/or mail merging enables you to print out a single letter, but with an individual's details on each letter. A special letter format must be adopted, entering '@' references where you wish the data to appear.

A letter such as:

Mr. Smith
Sovereign Builders
Any Town
Any Where
Manchester

17th December 1989

Dear Mr. Smith,

I am writing to let you know that Sovereign Builders can benefit from our current sale by allowing additional trade discount if you purchase over £150.00 of goods, by 31st December 1989.

could become:

@0
@1
@2
@3
@4

17th December 1989

Dear @0@@@@@@@@@@@@,

I am writing to let you know that @1@@@@@@@@@@@@@@@@@@ can benefit from our current sale by allowing additional trade discount if you purchase over £150.00 of goods, by 31st December 1989.

The '@' characters are replaced with the relevant field and by utilising the "Use TAB parameter file" option within the Print dialogue box (press <print> and specify where the address file can be found) PipeDream will print out the personalised letters.

Should you wish to use the database to enter records within a letter, you would use PipeDream's macro language.

Assuming that you had loaded a letter at slot reference A1, then you could do a search on the database <ctrl-BSE> for a particular person's name, where the database might reside at slot reference G100 – G500 i.e. 400 records, with the fields taking up columns G to P, for each record. Assuming the first occurrence of 'Smith' was not the correct one, you would then issue the command, next match <ctrl-BNM> until the correct record was found.

With a macro already made up you could then issue the following commands:

save position	<ctrl-CSP>	
mark block	<ctrl-Z>	
goto slot A6	<ctrl-CGS A6>	where the address should start
copy block	<ctrl-BC>	
clear markers	<ctrl-Q>	
restore position	<ctrl-CRP>	this will find the relevant line
next column	<ctrl-CNC>	
mark block	<ctrl-Z>	
goto slot A7	<ctrl-CGS A7>	next line of address
copy block	<ctrl-BC>	etc, for as many fields as you wish to transfer into your letter.

PipeDream: Conclusion

Within my own business environment we use

PipeDream extensively for wordprocessing and spreadsheet facilities and we look upon it favourably (indeed this review is written on it). However, we find we are restricted on the database, as the data is all in memory and machine-memory is limited. Functions being slanted towards the spreadsheet side of Pipedream is also limiting, as it is not possible to show records in the style of a card.

As a database it is extremely flexible, being able to add or delete fields at the press of a button, i.e. add column <ctrl-EDC>. With other databases you are not able to add fields as easily and usually end up having to make out a new card template and transfer your existing data into the new card.

In addition, Pipedream can effectively have variable length fields by issuing the increase width of column command <ctrl-W>, which makes it extremely flexible.

Colton Software have done marvels with their combination package. In my opinion, it is almost as good as a dedicated database but with the added advantage of wordprocessing and spreedsheet facilities thrown in! All at a cost of approximately £170 (£145 through Archive).

MultiStore and System Delta Plus

Both of these packages were written by Minerva Software and as I have received MultiStore so close to the publishing date for Archive, I felt it prudent to let you know my initial impressions of this software, comparing it to System Delta, as well as giving myself the additional time in order to acquaint myself fully with such an extensive package so as to be able to write a more thorough review later.

MultiStore is a "huge" package, with extensive dedicated database facilities. It is more than just a general re-write of System Delta, converting it to RISC-OS. In memory it takes 336k of user ram. It is fully multitasking, allowing all correctly written packages to work with it, allowing data to be imported and exported to and from the database into wordprocessors (Pipedream?), Graph Box (Graphs/Charts), etc.

When MultiStore dropped through my door, I found that it contained two discs and, for a manual, an A5 ring bound folder containing 188 pages. The manual was put to one side (as all good reviewers should do?) and I proceeded to work out what to do.

The first disc contains MultiStore, MultiStore Import Facilities, Examples, !System (containing colours module), !MSModules (MultiStore's own modules), Wordwise Plus program data exporter and Flag Sprites of the world, some 711k. Disc two contains some more examples, an import test edit file, label format and duplicate of the flag sprites, some 170k.

(Being a Wordwise Plus "expert" I had to have a look at their segment program. What I found was: not a procedure in sight, 13 GOTO commands in under 100 lines of code! For example, the only reference to the 'label .a was:

```
IF A%=0 THEN GOTO a
CURSOR DOWN A%
.a
```

I only hope that MultiStore itself was not written by the same programmer! Ed.)

Copying the disc to Hard Disc – as per RISC-OS convention – was easy and when I proceeded to initiate MultiStore, I was prompted to enter the MultiStore disc into drive 0.

I initially thought that, contrary to popular belief, MultiStore **was** copy protected! Well, at least semi-protected –the last nine tracks of the disc seem to have been corrupted but after talking to Paul, I reckon that although the top nine sectors are corrupt, you can *backup the discs or *COPY the programs and data onto other discs and they seem quite usable. I suspect that Minerva are puting unformatted discs into a bit copier which only fomats and copies the first 71 tracks. In fact the second disc only has 19 tracks that are **not** corrupt. No, I think Minerva have at last "seen the light" and taken what many Archive readers would suggest is the more sensible approach of not using copy protection. I trust that all Archive readers will respect this change of policy and, if they see anyone breaking the trust which Minerva have placed in us, will report the fact to Minerva.

I looked at a couple of their examples and found the browse window similar to System Delta, with the controls similar to a cassette recorder, allowing single card forward and backward, fast forward and rewind and a stop button.

Having already been using System Delta Plus, I felt that I would disregard the remaining examples and create my own card – this is where I had problems.

Pressing <menu> over the MultiStore Icon gave me a menu containing:

INFO
TRANSFER
FAST SORT
CREATE
STATUS
PRINTER
QUIT

Selecting create gave a string of errors! At this point I had to press <ctrl-break> to exit. Speaking with Merlyn Kline, of Minerva Software, it appears that in Version 1.00, the create option did not dynamically extend my RMA and this has been corrected in Version 1.01. On my machine I had the RMA set to 0k and this was the problem.

Minerva sent me a new disc straight away but, unfortunately, they sent me Version 1.00 again. They sent me a new disc but, unfortunately it has a disc error(!) and so I have still to receive the new version. (Click <adjust> on the MultiStore icon to find out which version you have got.)

Christmas is now upon me and so I will limit the remaining part of this review to the options available, and describe them more fully next month.

- Sorting can be by indices, or filtering, if set.
- Dragging of fields into other fields is possible, even into Pipedream and back again, and there are facilities for Mail Merging/Mail Shots.
- There is password protection for files, even down to telling you when people have been trying to access your files, giving the attempted password and date and time of use.
- Printing allows three font styles within reports.
- There are various reports that can be issued or printed; card, sheet, wordprocessor, paged.
- Old System Delta files are easily imported to MultiStore.
- Up to 9 sprites can be included within each card.
- Linking files with common fields giving a fully relational database.
- Being able to telephone people **without** a modem (think about that one!)
- Adjusting fields by Macros.
- Card transfers.

MultiStore costs £299, (£250 through Archive) which will make people think twice (?three times) before buying it. I think I must state from the outset that I am not employed by Minerva, nor do I have shares or any vested interest in them.

There have been other reviews of this software which, although extolling the virtues of this software and comparing it favourably with DBase 4 (priced at around £400.00), then turn round and say that it is over-priced! It takes a considerable number of man hours to produce software such as MultiStore – some 6000 lines of code in the main program and 8 template files with numerous windows.

It does not require the user to learn extensive commands or require programming skills to take full advantage of the package, unlike DBase 4. Should a package like this become available for the PC, I would expect it to retail at something over £600!!! It would be impossible to run a package like this on a BBC micro and programs on this machine could be made relatively simply and would not take many man hours, to develop. In the "good old" BBC days, schools wouldn't really want to pay more than about 8p(!) for software and people generally indicated that £40 was more than they were prepared to pay for programs on such a machine.

If the Archimedes is going to develop significantly and become the games / business / education machine that beats the opposition hands down then it must be made commercially viable for software vendors to produce the software and this means reasonable prices.

This type of software has been developed for the business market and I believe that the laws of supply and demand will peg the price at a suitable level. I personally would have no hesitation it recommending it and buying it, although I would like to see an accounts package linked to it. (How about it Minerva?) A

PipeLine

Gerald Fitton

"How do you get 132 character rows displayed on the screen?" has been answered by many contributors. From within PipeDream 3 you can click the mouse "Menu" button on the Palette icon (installed on the bottom icon bar by Acorn – this is the icon that consists of 16 coloured squares in a 4 by 4 grid), run the pointer through "Mode" and position it just below "20 (multiscan)" and type in 16 followed by <return>. The PipeDream window becomes half its previous width and you must go on from there to enlarge it using the mouse to drag the bottom right corner of the window out to the right. Perhaps the simplicity of this operation is another good reason for upgrading from PipeDream 2? No one has yet come up with a (simple) solution to this question using PipeDream 2.

My thanks go to Maurice Edmundson for an alternative method using blank windows which is specially suited to the RISC-OS facilities of PipeDream 3. His example, with explanatory text, is on the monthly disc.

Mouse sensitivity

There seems to be some confusion as to whether this question was about the pointer movement or about the "clicking on a line" procedure. If the pointer moves too quickly for you then the answer is to use the !Configure utility provided by Acorn or *Configure Mousestep 1". If you find that holding down the mouse button too long gives you a blackened line of text then maybe your auto repeat setting is too short. I am expecting a good answer to this second sensitivity problem from Colton before the February issue of PipeLine... watch this space!

"Shuffling" phrases without using "split/ join lines"

When you have written a sentence with the words in the wrong order, e.g. subject at the beginning instead of at the end of the sentence, then the easiest way of moving the words around is to use the "Cut and Paste" facility. This is how it works. Use the "Delete Word" command, <shif-f4>, to delete the words you want to move, then "Paste" them back in where they have to go using the (PD3 <ctrl-I>) or (PD2 <alt-I>) insert command. You can store many more words in the PD3 "Clipboard" this way than you can in PD2. The clipboard works on a last in first out system so you need to plan a complicated "Cut and Paste" with care. You can "Cut and Paste" to the end of a slot, a whole line, a marked block or any combination of these.

Left and right justify

Many of you have expressed the view that justifying left and right to two different widths starting from the same left margin can't be done! Colton have sent me a printout showing that it can. Remember, there is a bottle of champagne for the first reader who sends a solution to Colton which is not classed as cheating.

Printer drivers

Has any reader got a driver for the Star LC 10 colour printer? Philip Green has a non RISC-OS printer driver for the Hewlett Packard DeskJet and LaserJet printers which prints 20 cpi and 12 lpi giving 160 characters across and 160 lines down a sheet of A4 (about 1/4 the usual size and, he says, very useful for spread sheets). I haven't got a copy yet but I will try to get it on the next monthly disc. Please let me have a disc copy of any printer drivers you are willing to make available to Archive readers. One non RISC-OS that I would like is one for my Epson GQ-3500 laser printer so that I don't have to use the 6 minute RISC-OS driver every time I want a draft copy. No I don't have a RISC-OS driver for the Epson GQ-3500 – I use it in HP emulator mode.

Your own dictionary

If you don't like Colton's Dictionary and you want to replace it entirely, for example with the Hodge Dictionary or with a foreign dictionary with no English words in it then you must delete or change the name of Colton's and rename one of your own as "dct". You should use "Pack user dictionary" which you will find under "Spell" (in the long menus if you are using PD3) before changing the name to "dct".

A bibliography

Daniel Dorling has sent a full version of his

"Bibliography" in "Tab" format which includes over 500 entries. His comment is "I'm afraid it's not very interesting reading" but I found it quite fascinating – so it's on the monthly disc complete with the file used to obtain his preferred format. If you add substantially to it, or create your own then I would be interested in a disc copy please. Later on in this series of articles I may use it as an example of a database and how to find what you want using key words so any additions or comments will be most welcome.

Address labels

I have had a long letter from Maurice Edmundson which contains many useful hints and tips. One section of that letter explains in detail the way in which he generates address labels and entries for his personal "6-hole punched" organiser. Generally this follows the principles explained last month but the example is a good one with a lot of detail for anyone still struggling. Rather than include the detailed explanation in the PipeLine column, which would repeat in part the explanations from last month, I have included Maurice's disc files and the relevant part of his letter on the monthly disc. To use his words, "It takes a long time to write things down which normally take a few seconds to execute". I echo this and would add that one good example is probably worth a thousand words – and Paul won't let me have a thousand words for PipeLine!

GraphBox to Pipedream

I have just received my copy of Presenter II and haven't had a chance to try it out with PipeDream yet – more about Presenter II in a month or so. I have had a copy of Minerva's GraphBox for some time now and so I use it for most of my statistical work. I generate the files of numbers in PipeDream and then transfer them to GraphBox. The file is extended by GraphEdit which, in particular, sets up the type of graph, grid lines to be printed, etc. Sometimes, after this, I need to change the numbers and so I need to put the amended file back into PipeDream. This didn't give me a problem with PD2 but I had trouble with PD3. David Wild explains *"You can import the GraphEdit files into PipeDream using the CSV option. The strings which describe the graph show up initially as "bad expression" because the quotes are missing, but pressing <F2> will solve the problem"* and, if you press <F2> after marking the whole file, it does!

Upgrade to PD3?

I have received a lot of letters asking me for my opinion as to whether it is worthwhile upgrading from a non-spellcheck version of PD2 to PD3. The price of this upgrade through Archive is £68 or £37 if you already have the PD2 SpellCheck. (You must send the old disc(s) back with the order though.) You must make up your own mind but I believe that it is worthwhile.

PD3 is completely RISC-OS compatible so you can have many applications, including several PD files at once, running simultaneously. Perhaps the most significant, but not the only, new features are: the WIMP interface with multi-tasking and multi-windows, the fancy fonts which integrate with Acorn's new printer drivers, the inclusion of pictures in the text (so that PD3 has some of the features of a desk top publisher), external references (which I promise we'll cover in a future issue of PipeLine) natural calculation for speed and avoidance of manual recalculation, background calculation (transparent to the user), the spelling checker and, last but not least, the ability to import files of other formats such as View, Viewsheet and First Word Plus (making upgrading easy) and the ability to export files in many standard formats such as plain ASCII and CSV as well as Acorn DTP and, if you want, back to View (so you can export your PD files to a new word processor, spreadsheet, database or integrated package if you ever decide – a long time in the future I expect – that PipeDream is obsolete).

Next Month?

I was going to show how to create a simple spreadsheet (using the multiplication tables) this month but I have had so many comments and queries that I have run out of space. Next month then for an explanation of how to "Replicate" formulae rather than "Copy" blocks of text and how and when to "snapshot". If you have an example of a spreadsheet that you are proud of or can't make work then please let me have a disc copy and I'll see whether we can include it or fix the problem.

Help!

Is there a way of including footnotes in the same way as in First Word Plus? How do you transfer Archimedes PD3 files for printing on a PC? Are you stuck with PD2 on the PC? Have you any worked examples of the use of PD commands? What is the best way of sending long printer control strings when you have a non RISC-OS printer driver? Not quite a PD question but, what's the best way of printing an A3 size !Draw document as two A4 sheets? Can you set up a function key to read a value from an expression slot, do a calculation and return the answer to another expression slot? If so, then how generalised can you make this operation – or do you use a mouse?

Footnote

No! That wasn't a mistake in last month's PipeLine. I did program a computer about 14000 days ago. The computer was installed at Imperial College, London, where my Maths degree course included a unit called "Numerical Methods". Entering the program consisted of setting a bank of (I think) 5 switches to the opcode and pressing a button. The RAM elements were 14" racks of Post Office relays and the output device was a (5-bit) Baudot teleprinter; a bit noisier, physically larger, with less RAM and slower than an Archimedes. My first program found the square root of 2 to about a dozen significant figures! Can you beat 14000 days? Manchester or Cambridge?

Thanks

Thanks to all of you who have written in to PipeLine. It seems a shame to single out some rather than others, however I must mention Cedric Peachey, Philip Green, David Wild and Stephen Gaynor. Thanks particularly to those who sent in discs with examples of usage or problems. Keep them coming. A

First Word Plus Column

Stuart Bell

An old computing cliche is 'Garbage-In-Garbage-Out', inevitably shortened to GIGO. As far as this column is concerned, NINO ('Nothing-In-Nothing-Out') which was the reason for its non-appearance in December, would also have applied for this issue, were it not for the wonderful folk at Acorn who sent Paul a review copy of FWP Release 2, so here is a world first!

First Word Plus 2 – A review

'Swap Headings' flag bug? Forget it! 'Pause after each page' bug? Forget it! Mode 20 kludge work-around? Forget it! Needing an Interrupt Module to access the *prompt? Forget it! Yes, many of the bugs in release 1 (hereinafter FWP1) which will be familiar to readers of this column have been banished for good. Release 2 (FWP2) is, however, far more than a comprehensive bug-fix of FWP1. Most significantly, it runs as a multi-tasking application under RISC–OS, with all that that implies for permitting access to system resources (such as directory viewers and the Task Manager, as well as other applications) even after FWP2 has been loaded and its icon is on the RISC-OS icon bar.

The familiar but complex directory structure has gone – it is now much simplified. Gone too is the '.bak' system for keeping the previous versions of files and also the default 'format' file which set the default format for FWP files in that particular directory. Perhaps the greatest change is the way in which files are loaded for editing, with the hierarchical directory displays of FWP1 being supplanted by the facility to open up RISC–OS directory viewers either before or after entering FWP2.

The package

Firstly, three warnings. Firstly, I have not tested the graphics handling of FWP2, since I only have a daisy-wheel printer. The manual does not indicate any change in this area, except that pictures are now loaded by icon-dragging, in typical RISC_OS fashion. Secondly, I use a monochrome monitor and so cannot comment on the colours of the FWP2 screen. Thirdly, I am not familiar with 1stMail and so have not attempted to test FWP2's Mail Merge at this stage.

FWP2 comprises a manual, two discs, a Registration Form and reply-paid envelope, a new function-key label strip and a four-page release note. The manual is in typical new Acorn style – spiral bound with a card cover over the spiral. It runs to 157 pages (cf FWP1's 245). Significant savings have been made in the 'Tutorial' section, which may well create a market for 'hand-holding' introductions to FWP. This isn't to say that the manual omits anything – it just moves at a faster pace. There is now a 'Help' Menu which will go some way towards compensating for the shorter Tutorial section to the manual.

The two discs are marked 'program disc' and 'utilities disc'. The former contains the !1stWord+ and !1stMail applications, together with an up-to-date !System application with the latest versions of the modules which FWP2 uses. Hard-disc users must transfer these modules into their own !System directory. Additionally, we find four directories which will hold the files on which FWP2 operates – such as '1WP_docs' – and a small application, !1stChars, which gives access to 'weird' characters which are not directly accessible from the keyboard. As supplied, there are 344,064 free bytes on the disc, available for use as document storage.

The utilities disc contains two further applications, !1stConvrt which converts custom printer driver files in text form into config files (now of type 1WPCfg) and also !1stDMerge which merges dictionaries. Finally, the directory 1WP_Print contains sub-directories Config and Sources, with a selection of printer drivers. The directory names are much more intuitive – why on earth did FWP1 call printer-driver text files 'hex' files?!

The new function-key label strip indicates that most key-initiated commands are the same as for FWP1, although notably REFORMAT has moved from F12, which now gives access to the * prompt, as in RISC-OS itself. REFORMAT's new home is F7, and the displaced INSERT MODE command is

now accessible from the FWP2 'keypad', a new command window which can be selected by clicking 'Menu' when pointing to the FWP icon on the icon bar. COPY BLOCK has disappeared from the key-strip label entirely and is now available from the 'Select' menu or by typing <ctrl-C>. This used to be used to initiate continuous spelling checking, which is now only accessible from the 'Spelling Menu'. In short, only a few changes, but the 'knock-on' effect will confuse those familiar with FWP1 for a few hours.

The release note observes that at least 1M of RAM is needed to run FWP2, that it will run on a single floppy system – but that the software can be copied onto a hard disc – and that old printer configuration files and user dictionaries can be used if their file types are set correctly. Finally, it describes how to update the relocatable modules which FWP2 uses.

FWP2 in use

One's first reaction on booting FWP2 by double-clicking on the !1stWord+ icon is to think that nothing has happened because the main RISC-OS screen remains unchanged! Observation of the icon bar reveals a new icon – a 'page' – alongside the Task and Palette icons. Once FWP2 has been booted, it is activated either by double-clicking on a file – of type Text or 1WPdoc – or by dragging the file to the FWP2 icon. Indeed, once has RISC-OS has 'seen' the FWP2 application, simply double-clicking on a file will cause FWP2 to be booted. Up to four files can be opened at once – as was the case with FWP1. Attempting a fifth causes a warning message that the application needs more memory to start up, presumably because the system tries to load a second copy of FWP2.

The window opened up fills the whole page above the icon bar, and can be moved and re-sized at will. Other RISC-OS windows co-exist with it and any operation on files can be performed whilst it is active. In short, FWP2 is a well-behaved RISC-OS application. In the lower half of the FWP1 screen, there was a display of a font table, function key commands and various single key commands, such as 'Fixed Space' and 'Delete', obtained using the mouse. This display is no longer available. As noted above, 'weird' characters are obtained by making the !1stChars application display a similar font table. This application requires 16k to run, which can be awkward if FWP2 has taken a lot of the available memory. This is not as unlikely as it seems: read on!

The function and other commands are obtainable on the FWP 'Keypad', the window accessible from the FWP icon. At this point we may note that the keypad also selects the printer port being used and the printer configuration file which is loaded. If the default is not wanted, alternatives are obtained by dragging the required configuration file icon over the appropriate field in the keypad. The default can be 'permanently' set to your usual printer. In order to know if, for example, 'Bold' is on, you need to move the keypad window to the bottom of the screen, roughly where FWP1 displayed the same information...

It should be noted that FWP2 does **not** use the standard RISC-OS printer drivers, and that files are not printed by dragging their icon to the appropriate printer icon. Instead, the familiar FWP system of user-writable printer configuration files is employed and, as we have noted, old files may be used. This does have the great advantage that the difficult Config file for your very unusual printer, which you struggled for days to produce, will still work and you do not have to try to produce a proper RISC-OS driver – at least, not yet!

Since most readers of this column will be familiar with the general style and facilities of FWP, I shall not describe them in detail. But, for those new to Acorn's definitive WP package for the Archimedes, a digression...

FWP: a brief description

First Word Plus is a 'What You See Is What You Get' (WYSIWYG) Word Processor written originally for the Atari ST and later for IBM compatibles. Style features such as bold, light, italic, super- and sub-scripts are displayed on screen. A ruler controls paragraph widths. Most facilities are available both from walking menus and the keyboard. Up to four files may be edited at once. Output is obtained via custom printer drivers, which may be altered by the user. A full footnote system is provided, as are headers and footers (fixed throughout a document). A dictionary provides

either checking-on-demand or checking-as-you-type. The whole document being edited is held in memory, which gives rapid movement, at the cost of a limited maximum file size.

FWP – Changes from Release 1

The FWP2 main menu will seem very familiar to those used to its predecessor. Because loading is now implicit, the file menu is re-named 'Save'. Either the whole file, or a block, can be saved. The term 'block', incidentally, seems to have disappeared from FWP terminology – so you can save a 'selection', or cut or paste it, for that matter. A window offers a field with the filename (not its pathname), and an icon representing the file is then dragged to a directory viewer. (No viewer is needed if the file is being saved from whence it came.) Since the file remains loaded, this is analogous to FWP1's 'save and resume' option. The file is exited using the window's 'quit' icon.

The Edit option is unchanged, but we may note that the 'WP mode', 'Hyphenation', 'Insert Mode' and 'Word Wrap' options are all set 'on' when a new file is edited. When re-formatting, the hyphenation window now allows you to adjust the position of the hyphen. The Block menu has become 'Select', with little change, whilst the Layout menu has lost 'read ruler'. Merging of files is now achieved by dragging a file icon to the required cursor position, so a file containing just a new ruler can be loaded in the same way.

The Style menu now boasts 'Upper case', 'lower case', 'Change case' and 'Title word' options, which do the appropriate transformation to a marked block – oops, I mean selection. These facilities are also accessible through four sometimes less than intuitive control-key functions.

The Spelling Menu is as before with the addition of a 'guess' option under the Browse window, but the dictionary has grown from 40,000 to 70,000 words. The good news is that this means that it rejects far fewer words. In this article, all that it queried were acronyms such as FWP, SCSI or RISC-OS, the prefix 're' as in 're-formatted', colloquialisms such as 'isn't' and 'Aargh!', terms like 'config', and, incidentally, 'colloquialisms'! But, it still flags as bad those words which FWP itself has split with a soft hyphen. Also, you still cannot 'unload' the dictionary, to create more editing space. FWP2 has to be totally reloaded to effect this. The very bad news is the effect of the enlarged dictionary on memory allocation on a 1M machine. So, another digression:

Memory usage with FWP2

The limit of my usage of FWP1 was reached with a 110k file, and the dictionary loaded. As far as FWP2 is concerned, I can forget that possibility, at least until a memory upgrade becomes financially viable. There are four related problems. Firstly, FWP itself requires an extra 16k – I know that's not much, but read on. Secondly, FWP2 loads about &16000 (about 90k) of modules – whereas FWP1 loads none. Amazingly, at this stage FWP2 offers about 15k more space than does FWP1, at least on my system, when FWP2 claims 440k of application memory.

Thirdly, and most crucially, the dict-ionary. The respective files are 67k (FWP1) and 118k (FWP2) long. That 51k comes off your maximum document size. It gives about 35k net less. In Mode 16 I end up with 47k available with the dictionary in memory, but no file loaded. (Also, since I last edited the 110k file, I've added an Oak SCSI Hard Disc. It's wonderful, but extra modules steal another 60k of memory!)

Ironically, it's using FWP2's mode-independence that's the final killer. Forget being tied to Mode 12, or Mode 20 with suitable kludges. FWP2 works under the RISC-OS Desktop. Any Desktop mode should be able to run FWP2. I haven't checked them all, but Mode 16 is wonderful! 125 columns – or even two 60 column documents side-by-side – displayed on the screen, and quite legible on my 17" monochrome (not multi-scan) monitor. But there goes another 52K. Aargh! Since in 'minimal' form, FWP2 actually offers 15k more than FWP1, I shouldn't complain. But the larger dictionary is useful, and Mode 16 is nice, but not both together with large files on a 1M machine. (Where are all these 310 memory upgrades?)

Printing with FWP2

As with FWP1, a file must be saved before it can be printed. However, since saving is analogous to 'save and resume', the file remains loaded, and editing can continue without re-loading the file. To

print a file, clicking 'menu' over the FWP2 icon brings a menu with one option being to display the FWP keypad. If the default printer device is not the required one, a file icon for the new printer's configuration file is dragged over the 'device' field on the keypad. To print the file, its icon is then dragged over the 'Print File' field. A new window offers familiar options such as number of copies.

As with the 'Page Layout' window, numeric options such as margin offsets can now be changed by clicking on up and down arrows, as well as editing the field itself. Additionally, 'pause between pages' can be set at this point. This is much better than FWP1's requirement of a new printer driver to set this flag. Once printing has started, the 'print file' field changes to 'status' which, when selected, shows the progress of printing and enables it to be paused or cancelled.

Summary

The purchase price of FWP2 is the same as FWP1, i.e. £79.95 + VAT (or £85 through Archive). The question for most readers must be, 'Is it worth it?' If you have no WP package already, then I would want to ask, 'What else is there?' Personally, I rule out packages which run under the 6502 (BBC Micro) emulator, for that approach is rather like buying a Ferrari and then staying in first gear. Likewise, except for occasional use, running packages under the PC emulator seems a bit daft – you might as well have bought a PC clone in the first place.

To harness the power of the ARM, you need a native mode WP package, which leaves you with FWP or... I suppose that Pipedream enthusiasts will suggest the use of that apparently excellent package, but as far as dedicated Word Processors go, it's either FWP or else perhaps Computer Concept's new DTP program, Impression. Reviews suggest that it combines many WP facilities within its primary Desk Top Publishing function and if the emphasis of your work is towards the production of finished camera-ready copy, then that might be the best path for you.

So, what may we conclude about FWP2? It is a good straightforward WIMP-driven WYSIWYG word processor. It is simple and does not include many of the facilities offered by top-end PC compatible word-processors. Unless you are a so-called 'power user', that won't matter and for mere mortals like me, its very simplicity, which means that I know almost all that it can do, is a real advantage. It integrates well into RISC-OS, is well documented and offers a sensible compromise between ease-of-use and power. Well worth having – but I am biassed!

For existing owners of FWP1, the worth of the upgrade offer is perhaps more debatable. Personally, I miss the '.bak' file system and the ability of FWP1 to load format files – though since FWP2 doesn't require you to specify the name of a new file before you save it, I'm not sure how this could have been implemented. Likewise, the gain of the access to RISC-OS directory viewers is balanced by the loss of FWP1's ability to step back through directory tree structures by using the 'close window' icon. If you want to step back, and the viewer has gone, then you must start with the disc drive icon again. I am also annoyed that the 'spelling check error with soft hyphen' bug remains in FWP2.

For lucky owners of 2M or 4M machines the ability to multi-task FWP2 with, for example, !Paint, will probably make the upgrade worthwhile. Less fortunate souls must be aware that there's not enough memory to multi-task FWP2 with any significant application. (I did use !Calc recently – very useful). The larger dictionary is nice and the mode-independence is wonderful, but the final decision is up to you. If you got FWP1 for half-price with the Arcwriter trade-in offer (remember that?), then you might conclude that you'll end up with a proper RISC-OS word processor having effectively paid just the full price once.

Finally...

Will NINO apply next month? Will this column be inundated with apparent bugs in FWP2? What will the 1990's bring to the world of First Word Plus? To find out, don't just wait for next month's column, but write to ask, inform, complain, celebrate or whatever, by about the 25th of January. You can contact me either at 56 Crescent Drive North, Woodindean, Brighton, BN2 6SN (no phone calls, please) or through the Archive office. A

DTP Column

Ian Lynch

A dongle, a dongle, my kingdom....

Computer Concepts certainly seem to have stirred up some strong feelings with their dongle. For the home or single user I can't see the problem if one isn't of the "Captain Pugwash" fraternity. However, things may be less convenient for multi-user environments and networks. Every machine on a network requires a dongle, and a site such as a school with many stand alone machines would need a dongle per machine as swapping dongles about the site would not be practical. It depends on how copyrights are worded as to whether it is legal, but a dongle makes the practice of carrying a piece of software on a floppy from a machine at home to a machine at work, a good deal less convenient. (You could always carry the machine to and fro!). Leaving aside the finer points of the legalities, the bottom line will be based around the following criteria.

1. Is Impression better than the competition?
2. Is Impression more expensive than the competition?
3. Is Impression more or less convenient to use (single user, multi-user etc)?
4. When will Impression be finished?

Impression is, in my humble opinion, better than anything else I have used on any machine. However, some things are bound to be subjective and on a machine with more memory, Acorn DTP is more competitive though still slower and more cumbersome. It would also be worth waiting to see if Beebug or Clare's can do better. Price comparisons will depend on how the licensing agreements work out and, I suspect, how rigidly people stick to them. Convenience of use will depend on your situation. Having talked to Charles Moir, I found him honest in the fact that he could not give an exact date but that improvements and free upgrades for current customers would be made available until all was working well.

Again it is a personal view, but I think that it is software such as Impression which will make or break the Archimedes and we should not underestimate the task of providing sophisticated tools, which are easy to use, for a relatively small market. I would rather wait a few months for something that does the job properly than have something which does nothing more than can be achieved on a PC. There are some very innovative people writing for a relatively small market with the Archimedes and I am sure they would produce bug free software at give away prices every day if it were at all possible.

(A number of people have sent in comments about dongles – amazing how much strong feeling there is! – but I think that, as space is at a premium, we won't continue the debate any further unless anyone has any substantially new agruements to offer. Ed.)

Draw file library

A comprehensive library of line art would be an advantage to any potential DTP enthusiast. I have a colleague at work who has produced some nice drawings, including a very impressive suspension bridge and I'm sure there must be many people out there with similar efforts. What I propose is that any drawings are sent to me and I will compile some Careware discs which can be distributed through Archive. As an incentive, anyone who sends in a drawing (of reasonable quality) on a disc with a self-addressed stamped Jiffy bag, will receive a disc with as many drawings as I have and can fit on a disc. A sprite library might also be possible but may be less easy due to the space they take up, so let's try Draw files first.

Did you know...?

Did you know that Apple are changing over to outline fonts (like RISC-OS already uses!) with their new System 7 rather than using bitmaps, as are Abode with Display PostScript. Acorn are well ahead, but we do need a bigger variety of typefaces available. Font management is essential in DTP and the outline system is more flexible and uses less disc storage. Another advantage is that very good results can be printed on dot matrix and laserjet printers without having to resort to the more expensive Postscript printers. The bad news is that printing can

take a long time particularly on smaller memory machines. Computer Concepts are working on a laser printer and podule which will give Postscript speed and quality for the price of a laserjet. Watch this space!

Finally, please write with any information or discussion points, or you will continue to get epistles like this one.

My address is 1 Melford, off Buckingham Road, Tamworth, Staffordshire, B79 7UX. A

Introduction to C – Part 4

Chris Dollin

In this month's article, I shall introduce more of C's input and output operations. For once, there will be no mention of cards!

Standard Prelude

In our previous articles, we have seen how to generate output using *printf*, which takes as arguments a string and a sequence of other arguments which are printed out according to the format directives in the string. Those of you who have tried out the examples will have discovered that the output appears on the screen (or appropriate window, inside the desktop).

In fact, *printf* sends its output to a place called the *standard output*, which is usually attached to the screen but *printf* is not the only function to send its output there. The most basic function for sending output to the standard output is *putchar*, which is declared as if by:

```
int putchar( int ch );
```

You might expect from its name that *putchar* took a *char*, not an *int*. However, in C, a character is just a small integer and, as we shall see below with *getchar*, there are sometimes reasons to allow more values than just characters. The value delivered by *putchar* is the character output – you may ignore it if you wish.

Just as C has a *standard output*, it has a *standard input* from whence characters can be acquired. The function *getchar* delivers the next character from the standard input:

```
int getchar(void);
```

To use either *getchar* or *putchar*, you must have

```
#include <stdio.h>
```

near the top of your program, just as you must for using *printf*. The standard input and output have the names *stdin* and *stdout* respectively – later we'll see these names in use.

Notice that *getchar* delivers an *int*, not a *char*. Why is this? Well, *getchar* must be able to deliver any character whatsoever (we'll see later that it may be reading from a file, as well as from the keyboard). In addition, when there is no more input to be had, *getchar* delivers a special value called *EOF*, which is distinct from any character. Since, in C, characters are just small integers, *getchar* delivers an *int*, which (if it is not *EOF*) is guaranteed to be a sensible *char* value.

Armed (ahem) with this knowledge, we can write a simple program which copies *stdin* to *stdout*, thus:

```
int main( int argc, char *argv[]
    )
    {
    int ch;
    ch = getchar();
    while (ch != EOF)
        {
        putchar( ch );
        ch = getchar();
        }
    return 0;
    }
```

This *main* reads a value from *stdin*. If it is not *EOF*, it writes it to *stdout*, reads another value and goes round again. Once it has read an *EOF*, it has finished and returns *0*.

It is worth noting that the usual way of writing this copy in C is rather more compact, relying on the fact that an assignment delivers a value. You would normally see the function above written as:

```
int main( int argc, char *argv[] )
    {
    int ch;
```

```
while ((ch = getchar()) != EOF)
                    putchar( ch );
return 0;
}
```

which combines the fetching and testing of the character into one expression, avoiding having to write two calls to *putchar*. The extra brackets round the assignment are necessary, as

```
ch = getchar() != EOF
```

means

```
ch = (getchar() != EOF)
```

which sets *ch* according to whether the value return by *getchar()* was or was not *EOF*. The result of this would be to write out a series of *true* values to the *stdout* – not very productive.

stdin is normally attached to the keyboard. If you compile (not forgetting the *#include* of *<stdio.h>*, and ignoring the harmless warnings about *argc* and *argv* being declared but not used) and run this program, what you type will be copied back to the screen. There are two things to notice.

Firstly, you can generate *EOF* by typing <ctrl-D>.

Secondly, characters are not copied immediately, but only when you have reached the end of a line and pressed <return>. This means that the line editing characters (<delete> to rub out one character, <ctrl-U> to delete the entire line) can be used. (This process of holding on to the characters until an entire line has been read is called *buffering*.)

Pointing for Puts

Since *stdin* is usually attached to the keyboard and *stdout* is usually attached to the screen, it may seem that this program is a little pointless. How often do we want to type characters, only to see them echoed? The key lies in the word usually: it is expected that C programs will run in an environment where the standard input and output can be *redirected* to (and from) other places. Suppose the program is called *it* – then we can use the RISC-OS redirection facilities from the command line:

```
it { < c.it > it/c }
```

This redirects *stdin* from *c.it* (where we have presumed the source of the program resides) and *stdout* to *it/c*. When the program finishes, inspection of *it/c* (using the *type* command, or *!Edit*) should reveal that it is an accurate copy of *c.it*. (See page 198 of the RISC-OS User Guide for more details on RISC-OS redirection.)

This facility makes the program very much more useful – it can copy from anywhere, to anywhere, without the programmer having to worry about opening files, naming them and so on. (Under the Unix operating system, where the standard input and output can be redirected to *programs* as well as *files*, redirection can be used to great effect.)

If you have Acorn C Release 3, you can obtain the same effect with the rather simpler command line (see page 142 of the manual):

```
it <it.c >it/c
```

Standard Error

Suppose that you have written a program which reads *stdin* and writes *stdout* and which may detect errors of various kinds. Where should the error report go? Clearly, *stdout* is not the right place as, firstly, the program user may not see the error report (it may have been redirected to a file) and secondly, if another program is going to read the output, it may get very upset at encountering embedded error messages.

To overcome this problem, C comes equipped with another standard place to send output, the *standard error*, *stderr*. This is normally attached to the screen, but can be redirected if necessary. (Note that using RISC-OS redirection means that *stdout* and *stderr* can only be redirected to the same place but, using Release 3 redirection, they can be redirected to **different** places.)

To write to *stderr*, we must use some new functions. The function *fprintf* is like *printf*, except it has an additional (first) parameter, specifying the place the output is to go:

```
int main( int argc, char *argv[] )
    {
    printf( "This goes to the
              standard output\n" );
    fprintf( stderr, "This goes to
          the standard error\n" );
    fprintf( stdout, "This is
        standard output again\n" );
    }
```

The program above should write three lines of output; two to *stdout* and one to *stderr* – you may wish to experiment with it using different redirection specifications.

In the same way that *fprintf* is like *printf*, except with an explicit destination for the output, so *fputc* is like *putchar* with an explicit output and *fgetc* is like *getchar*, with an explicit input.

Starring Files

Let us rewrite our input-output copier using *fgetc* and *fputc*, and place the copying activity in a separate function so that we could use it for copying in several different places.

```
void copyfiles( FILE *source,
     FILE *sink )
     {
     int ch;
     while ((ch = fgetc( source ))
     != EOF) fputc( ch, sink );
     }

int main( int argc, char *argv[]
     )
     {
     copyfiles( stdin, stdout );
     return 0;
     }
```

copyfiles expects two *FILE* * parameters, that is, two pointers to objects of type *FILE*. This is the type used to represent files by the functions declared in <*stdio.h*>. *stdin* and ***stdout*** both have type *FILE* *, so they are suitable arguments to pass. (Note that there is no *type* difference between an input file and an output file, so passing the arguments in the wrong order has unfortunate consequences.) You should not need to know anything about the *FILE* type, as all the operations on it you need to do on it are provided by the functions in <stdio.h>, in much the same way as we hid the representations of *Card* and *Hand* in our previous articles.

There comes a time when *stdin*, *stdout* and *stderr* are no longer sufficient. Consider, for example, an editor that must open files on demand from its user, or a compiler that must read input from *#include*'d files. C includes functions for opening files for input (or output) and closing them when they have been finished with.

This program uses *copyfiles* to copy a particular file to the standard output:

```
int main( int argc, char *argv[] )
     {
     FILE *source = fopen( "myfile",
                           "r" );
     if (source)
          {
          copyfiles( source, stdout );
          fclose( source );
          return 0;
          }
     else
          {
          fprintf( stderr, "Could not
                    open myfile\n" );
          return 1;
          }
     }
```

fopen takes two arguments. The first is the name of the file to be opened, here *myfile*. (C does not prescribe any particular format for filenames, leaving them implementation-dependent. On the Archimedes, *myfile* will be a file in the current directory.) The second argument is a string describing how the file will be opened – *"r"* means for reading, *"w"* means for writing. (There are other options but we'll leave them for now.)

fopen returns a *FILE* * value which is a pointer to the *FILE* object representing the opened file. However, *fopen* might fail to open the file, for a variety of reasons. For example, *myfile* might not exist. In this case, it delivers a special pointer value, the *null pointer*, which has the property that it looks like *false* in *if* and *while* statements.

If the *fopen* succeeded, *source* will not be null, and *copyfiles* will be called to copy the contents of *myfile* to the standard output. *source* must then be *closed*, which frees up the *FILE* it points to for re-use – not essential here, as *main* will exit anyway, but good practice. *fclose* takes a *FILE* * argument and arranges that the file is closed properly. Finally we return *0* from *main*.

If the *fopen* failed, *source* will be null and we write a suitable message to the standard output. We then return *1* from *main*. Implementations of C will try and arrange that this value is available to the

environment that ran the program – on the Archimedes, it becomes the value of the system variable *Sys$ReturnCode*.

You might like to experiment with variations on this program. For example, you could try reading the name of the file from the command line (see the program at the end of the first article) or arranging that the standard input is sent to a particular file.

Non-character input

We've seen how to write out strings, characters and numbers using *printf* and *fprintf*, and how to read characters using *getchar* and *fgetc*. However, we haven't seen how to read in anything **other** than characters, such as strings and numbers.

It is possible to read entire lines by using the function *fgets*, declared (by *#include <stdio.h>*) as:

```
char *fgets( char *s, int n,
                      FILE *source );
```

This reads at most *n-1* characters into *s*, stopping early if a newline is found (the newline is included in *s*). The result is *s*, unless an error or end-of-file is found, in which case a null pointer is returned instead. The next program reads in lines and then prints them reversed:

```
#include <string.h>

int main( int argc, char *argv[] )
   {
   char line[100];
   while (fgets( line, 100, stdin ))
       {
       int i = strlen( line );
       while (–i) fputc( line[i-1],
                         stdout );
        fputc( '\n', stdout );
        }
   }
```

strlen gets the length of a string. Note that the length will always be at least one, as the shortest string will be an empty line, including the newline at the end.

Another way to read input is using the function *scanf* (on the standard input) or *fscanf* (on other files), which provide the input counterparts to *printf* and *fprintf*. Here's an example showing *scanf* in action:

```
int main( int argc, char *argv[] )
   {
   int n, i;
   char s[100];
   while ((n = scanf( "%d %s", &i,
                          s )) == 2)
      printf( "Got number %d,
               string %s\n", n, s );
   if (n == EOF) return 0; else
                          return 1;
   }
```

The first argument to *scanf* is a format string, showing how the characters in the input are to be interpreted. *"%d"* means that a decimal integer should appear, spaces are ignored, and *"%s"* means that a sequence of characters ended with a space (or newline) should appear.

The value of the number read is assigned to the integer whose *address* is passed as the second parameter; hence the need to apply the address-of operator *"&"* to *i*. The string read is assigned into the character array whose address is passed as the third parameter. As discussed in the last article, an array decays into a pointer to its first element, so we do not use *"&"* here.

The value returned by *scanf* is *EOF* if there is no more input available – otherwise it is the number of items converted. If this is less than the number requested, then an error has occurred. If we've read two items, they are printed out, otherwise the loop finishes. If *scanf* has run out of input, we return *0* for success – otherwise we return *1* for failure.

Having demonstrated *scanf*, we must warn against using it except in special circumstances. It is somewhat inflexible and easy to misuse, particularly when the input is being generated by a person rather than a program. *scanf* will happily read across line boundaries in its search for characters, which can be inconvenient for line-oriented input. Often it takes more coding effort, but is safer, to read the input character by character and dissect it by hand – we may deal with this in a later article.

Aftershock

Because *putchar* may be implemented as a macro (using forms of *#define* that we have not discussed), care must be taken when the argument to *putchar*

has side-effects (i.e. changes the values of variables). Code such as

```
putchar( chars[i++] );
```

(where *chars* is presumably an array of characters) is dangerous, as it may evaluate the argument more than once, hence incrementing *i* more than once. Almost certainly better would be to use

```
fputc( chars[i++], stdout );
```

Closing

In this article, we have seen how to do input from, and output to, the standard files provided by C and from and to files that we have opened ourselves. The generalised *fprintf* function allows formatted output to be generated on any file and *scanf* and *fscanf* allow formatted input to be read in restricted circumstances, although our advice is to stick with reading characters.

Forward reference

In the next article, I hope to show how the facilities in Release 3 of C can be used to write simple desktop applications. As always, any comments on the articles are welcome and can be directed to me, care of the Archive office. A

!Cfront from Mitre

Martyn Lovell

!C-Front provides a RISC-OS desktop-based front end to releases 1, 2 and 3 of Acorn's ANSI C Compiler. Integrated with this is an implementation of the classic Unix 'make' utility which allows rapid compilation of multiple-file projects. Two small utilities are also included: one provides a 'sticky' desktop background, the other sets filetypes in the desktop.

When !C-Front is first loaded it must be configured to suit your preferences and compiler release. This process is quick and simple. The configuration can be changed at any time and can be saved so they are automatically reloaded at startup.

Using !C-Front to compile single source files is very simple: you just drag the source file to the !C-Front icon on the icon bar and the file compiles. An annoying feature is that you can only drag text files to the icon and have them compiled. If you have created a file type for C Source files then you will have to convert to Text filetype all source files before you drag them to !C-Front.

!C-Front really comes into its own when you are working on multiple-file projects. Included in the package is MitMake, an implementation of the Unix 'make' facility. 'Make' programs allow you to specify which source files need to be compiled to make which object modules and program modules. They also have the ability to check whether a source file needs compiling at all, thus minimising compile time. MitMake effectively allows the whole compilation process to be done just by double clicking on the make file. It also has extensions to enhance its use under RISC-OS.

The !C-Front compiler interface is very flexible. Each compiler, linker and MitMake option appears as a menu entry and can be altered with a minimum of difficulty. Strangely, in a supposedly intuitive interface, Mitre have made no attempt to humanise the options provided by the programs. Thus one is presented with a bland and rather unhelpful menu containing options such as "-c". Though this is easier for those experienced using all the compiler options, it is no help for anyone who needs to know which option means 'just compile' – you still have to resort to the manual or to *cc -help.

Since it is possible to save several configuration files, it is easy to have the system configured exactly as you want it for each project you are working on. A further extension of this system allows different source files in a project to have different options settings. You simply add a line /*CFRONT> optionfile */ at the top of the source file and the named optionfile is loaded. The only problem with this is it conflicts with the convention used by Twin (the original Acorn text editor), which will recognise the first > on the first line as the default filename with which to save the file.

The !C-Front documentation is short but complete. It comes in an a A4 bound format; it is all in typescript but has no index. Though this makes it a little difficult to find what you want, it is short

enough that this is not a serious limitation: I always found what I was looking for quite quickly.

!C-Front comes with two useful utility programs. One is !StickyBd, a program that allows you to stick files, folders or applications to the desktop background. This is like !TinyDirs, but far more versatile. It is possible to store many different named boards as files on a disc and use different boards to allow easy access to different sets of files depending what you are working on. I found !StickyBd useful, but ended up going back to using !Backdrop, a public domain program of a similar type. Although it does not allow loading of a multitude of boards, it does get application icons right all the time. !StickBd will only correctly display an application icon if the Filer has seen that application during the current desktop session.

The other program, !SetType, allows you to change the type of a file from the desktop by dragging the file's icon to the !SetType icon. This saves a lot of typing of pathnames. It is even possible to pop up a menu of possible filetypes, allowing the user to settype without touching the keyboard. Unfortunately, if you drag a number of files to !SetType, you are provided with a dialog box for each. This is what is required in some situations, but in others it would be useful to be able to set them all at once.

As I was completing this review, I received a free upgrade to !C-Front 2.18 which fully supports the C release 3 compiler. MitMake is still provided, though it is somewhat superfluous as Acorn C now comes with a make utility. I have not been able to compare these two make programs in detail yet.

I have mixed feelings about !C-Front. It is undoubtedly a useful utility for those working with the Acorn C compilers. It manages to integrate the compilation process into the desktop quite smoothly. Its interface conforms to the RISC-OS standard, though parts of it are less than friendly. It also represents quite good value for money. However, it has not converted me to doing my development from within the desktop: I still prefer to work from the command line. !C-Front is good if you normally develop in the desktop or if you work on large multi-file projects.

!C-Front is available through Archive for £18. Users will need to have the RISC-OS operating system (still available at £36) and an Acorn C Compiler. Release 3 of this compiler is now available through Archive for £145.

Mitre Software Limited can be contacted via the Archive BBS as account 449. A

Credit where...

• **Dabhand Computing** – David Manttan would like to congratulate Dabhand Computing on their excellent post-sales advice having bought his A3000 and CM8833 monitor from them.

• **Minerva Systems' upgrade policy** – Upon enquiring about Minerva's policy on upgrading System Delta Plus to the new version 2, I was pleasantly surprised to find that they sent me a replacement version 2 disc free of charge. Minerva have also provided me with updated versions of GammaPlot, Reporter and SigmaSheet upon return of the original program discs – again free of charge. Rob Brown A

Small Ad's

• **3.5" internal floppy disc drive** – £105 o.n.o. (owner upgraded to hard disc) M Titmas 0255–253163 (work), 814153 (home)

• **A310 colour** + RISC-OS, 2nd 3.5" drive, I/O podule, battery-backed CC ROM podule + 32k ram and much software. £900 o.n.o. Phone Iain on (0925) 66889.

• **A410/1** (6 months old) with additional 1Mb RAM, 50Mb hard drive, Watford Video Digitiser, CC ROM podule, PC Emulator and lots of software £1650. Contact Mr Flemming after 6 p.m. at (0244) 535204.

• **First Word Plus £46**, Acorn colour monitor £130 o.n.o. Phone 01–579–0607.

• **Logistix**, SolidCAD, Graphic Writer, and Conqueror. Offers to John Ward, telephone 01 540 8461.

• **Jigsaw** – a RISC-OS desktop game £20 or swap for Interdictor. Ring Barry Ashfield on 0964 652288 (day time) or 0482 649187 (evenings). A

Acorn's Assembler

Martyn Lovell

The Archimedes is one of the few microcomputers available today that comes with a built-in assembler. The BASIC assembler is a remarkably powerful program. It unleashes the full processing power of the Archimedes computer with a minimum of effort. However, it suffers from a number of limitations, many of which are addressed by Acorn's stand-alone Assembler.

The Acorn Assembler package comes with two assemblers (AAsm and ObjAsm) and a linker. AAsm is a simpler assembler that generates machine code directly. ObjAsm generates object files suitable for linking to other object files generated, for example, by ANSI C or ObjAsm. Installation is quite straight forward: floppy disc users simply copy the files they need to work with and hard disc and network users can use the Install program supplied. To work with AAsm/ObjAsm you will need a text editor. !Edit (as supplied with RISC-OS) works fine but I prefer to use Twin, Acorn's two-window text editor, which allows me to assemble in one window and step through errors in the source code in the other. The assembler works from the command line: it does not multi-task under RISC-OS unless placed into an Edit Task Window.

Documentation

The AAsm user manual is well printed in a spiral-bound format. It describes all the ARM op-codes and the assembler syntax. It does not contain any tutorial material on programming in machine code but does contain several useful example code-fragments. If you need tutorial material you will have to buy one of the books available that teach ARM assembly language. The manual seems strangely organised to me but there is a quite comprehensive index, so this is not such a limitation. A reference card is also supplied with the package which summarises the ARM op-codes and the Assembler operators and command line switches. I found this card useless since it omits the less memorable assembler directives but it would probably be useful for beginners at assembler programming.

Debugging

There are no debugging features provided with the assembler at all. Debugging can be done using the Acorn debuggers 'asd' and 'dbug', which are supplied with the Software Developer's Toolbox package. However, all I find I need for most of the time is a memory editor and the operating system's in-built breakpoint facilities.

Features

The assembler supports a wide range of arithmetic and string expressions allowing considerable flexibility in the construction of macros and source files. There are also five supported data types: boolean, numeric, string, program-relative and register-relative. There is slightly incomplete support for strings: there is no equivalent of BASIC's MID$, but this can be easily simulated with a macro.

Aasm/ObjAsm has a better range of pseudo-instructions than any other ARM assembler I have seen. As well as the ubiquitous ADR, ADRL is supported to allow loading of further distant addresses on one source line, generating 2 instruction words. Translation also occurs between MOV and MVN, BIC and AND, ADD and SUB, ADC and SBC, CMP and CMN. For example:

```
ADD r1,#-2
```

would be translated to

```
SUB r1,#2
```

since ADD r1,#-2 cannot be assembled directly. The assembler recognises all ARM FPU instructions.

One powerful feature of the assembler is the ability to define a literal storage area (with the LTORG directive) and then load registers directly with constants with more that 8 significant bits without any extra effort. The instruction

```
LDR r3,=Workspace_Size
```

will generate a MOV/MVN if it can and if not will put the value of Workspace_Size into the literal storage area and generate a program-relative LDR.

Another useful feature is the ability to lay out storage areas as a set of objects. You can lay out an area of memory as offsets from a numeric value (e.g. for building address tables for fixed-position tables) or as offsets from a register (e.g. for laying out module workspace). The following example demonstrates this:

```
                ^ 0,r12; offset from
    module workspace pointer
Work_Start  # 0     ; used for
    offset calculations
Version     # 4     ; define a 4
    byte space
StatusBlock # 16    ; a 16 byte
    area
...
```

Then, in the code you can use

```
LDR r0,Version      ; r0 gets
    contents of r12+0
ADR r2,StatusBlock ; r2 points to
    r12+4
```

Macro support in the package is comprehensive. You can define macro parameters and a return value and also set up local labels. There is also a conditional assembly feature. You can keep general macro definitions and constants in separate files which can then be imported with the GET directive. Source files can be 'chained' with the LNK directive.

There is a wide variety of directives including ones for conditional assembly, repetitive assembly, local and global variables and error generation. Objasm also includes directives to control the output of the Acorn Object Format file.

Few features immediately strike me as lacking in this assembler, except, perhaps, a fully multi-tasking version. I would also like to see better support for nested data structures. I have found no bugs in the version of the assembler I have. There are, however, a few anomalies, such as the need to indent some directives (e.g. 'END' which denotes the end of a file) for them to be recognised.

The Acorn Assembler is quite highly-priced compared to the one offered by Wingpass (£47 –reviewed in Archive 2.8 p 41). Yet is is considerably more versatile than Wingpass. The only exception to this is in support for the 'C' programming language where Wingpass is superior. I would recommend the Acorn Assembler for most serious assembler programming, if you can afford it and if 'C' support is not of over-riding importance.

The Acorn Assembler is available through Archive for £195 and Twin is available for £29. A

Graphics Applications

Jim Markland

Some time back I set about planning an educational software package: a package to generate a greater public awareness of a major research facility with which I am connected. The software package aims at the Archimedes and might well turn out to be a 'tour de force' of that micro's capabilities. In the preparatory process I have begged, borrowed, cajoled and sought advice from all sorts of people. Many thanks, especially to those who led me to a preliminary exploration of Archimedes graphics.

In the event, it would appear that, at least in part, the results of these investigations may be of wider interest (especially to those operating on a relatively tight budget) and, hopefully, may stimulate further discussion.

For present purposes, graphics images can be reduced to two types:

- Bit mapped images (raster images or sprites)
- Vector plots

Related data handling operations typically involve:

- Importation of graphics files from elsewhere
- Creation of data files for use by graphics applications
- Writing to the screen via the VDU drivers
- Reading from the screen
- Editing, merging and printing images.

Thankfully Acorn have given us a number of application packages with which to manipulate static images. These include the ability to create the

two types of graphics image – although both !Paint and !Draw fall short of the ideal in a number of important ways (as certain features are relatively easy to provide, one may be excused for suspecting deliberate built in obsolescence!). Both packages do, however, allow the editing and printing of the images so created and, in the case of !Draw, they provide the facility for combining those previously constructed.

As such, both applications offer attractions for graphics development over and above those offered by the direct use of the VDU drivers. They do, however, suffer from the drawback that, although they may be efficient vehicles for data handling, their file formats are obscure and distinctly non-trivial for the armchair or younger programmer. Without the programmer's reference manuals and much patience, these appear to be clear no-go areas.

In a previous article, extolling the virtues of APL, (Archive 3.3 p 48), I referred to the need to interface programs with application packages and that is the burden of this article: how to create !Paint (sprites) and !Draw files the easy way, under program control and at low cost, for the above range of graphics data handling operations. There is, furthermore, the need to establish some forms of widely applicable standards – almost without regard to hardware requirements (such developments still continue at an awesome pace).

"Never before has the wheel been re-invented on such a scale"... I read this quote about software developments, by a computer manager with whom I was once associated, **before** micros entered the home. This need for standardisation applies not only to programming tools but also to file formats. Back to the plot...

Some of the more stunning graphics images come from Ray Tracing routines, although don't expect hyper-realism, and the adventurous are warmly encouraged to investigate the same. A useful place to start is David Pilling's port of the MTV public domain package. (I have also seen reference to others, but know not of their provenance.)

Once the concepts of diffuse and specular reflections are mastered, the world will never appear the same again! A good mainstream graphics text is useful here. MTV input files are relatively simple (NFF neutral file format) and can easily be generated by your own programs. This is particularly for polygonal structures.

The MTV package also provides an optional intermediate stage in the production of sprite files – in the form of the 'out_pic' file. These files have a very simple format and, as such, can be extremely large (but need only enjoy a transient existence), having triplets of ASCII characters for each pixel (one each for Red, Blue and Green). In themselves they offer a simple route for developing programs to import bitmapped images from elsewhere or, alternatively, to mathematically design your own application icons. The latter can be done using a tiny piece of I-APL code. (An excellent case for using APL for prototyping here. No problem including these sprites in magazine listings!)

Ready-made sprite import packages are also available. These include the ChangeFS programme (Risc User October(?) 1989 monthly disk) which will handle files of specific formats and also convert sprites between modes. Other individual opportunities have also been noted in the press (e.g. Noah Tools – see Archive 3.1 p 3)

There are, therefore, relatively low cost opportunities for importing and creating sprites automatically outside the restraints (or talent) of he who wields the mouse. (I am reliably informed that the mouse is a very poor substitute for a pencil or paint brush.) Sprites can even be manipulated easily if the originals are in the MTV pic format.

Beware, however, disk full errors at the end of a four hour (or even four day – I jest not!) Ray Trace. Large multicoloured bitmapped images fill disk space very quickly indeed and there is much merit in considering the use of an archiver such as David Pilling's Spark.

Vector images typically require smaller input files and are generally less of a difficulty to create as !Draw already accepts a version of Autodesk's DXF (Data Exchange) file format. Don't be fooled by this though as the DXF format is verbose and can also produce big files. It isn't clear how serious Acorn were when they included this facility in the application as it is far from complete and there are

many pitfalls for the wandering rodent at DXF menu response time – not much error trapping here and a clear case for !Draw_2, I think.

Acorn do not, I am advised, describe their adaptation of the DXF format (file type &DEA and no leading spaces in the file) in the programmers reference manual although there are several readily available books describing the AutoCAD format (read as FLATLAND=1), with exceptions to this noted in the RISC-OS User Guide.

I have, in recent rare moments snatched from other duties, produced simple demonstration files for most of the DXF entities (e.g. Polyline, Text, Circle etc, although there are a small number of irritating difficulties and the ColourTrans module, I think, persists in hiding Points) and a file writing program written again (!) in I-APL, although this could have equally been done in BASIC. The next step is to produce the proverbial seamless interface with !Draw.

DXF files (used on the Archimedes not only by !Draw but also, I understand, by Euclid, WorraCAD, AutoSketch and Oak's Parametric Design Tool – please ask the suppliers for details) offer a very useful and simple way of producing, merging and editing 2-D vector plots with !Draw and, incidentally, using fonts in a small way. Vectors may then be combined with sprites and text files in Desktop Publishing.

This brings us nicely back to Ray Tracing because the more demanding user might prefer a 3-D graphics package to prepare the input, especially if vector normals are needed. The DXF format fully contemplates the third dimension and, generally, retains its utility at this level. A link to Euclid could be useful if anyone cares to provide the same. *(Elements, the Euclid User Group offer a link to a public domain ray tracer, QRT, and a program to link to Euclid. See Archive 3.3 p 16. Ed.)*

DXF files, unlike !Draw files, can be read by (some) humans, exchanged to and from PC applications and modified using !Edit. This allows complete Archimedes/PC transferability of code and files if you use I-APL given appropriate versions of the file handling functions and newline characters. This ad-hoc combination of 'universal' language and file format appears to move in the direction of the, so desirable, standardisation. Acorn please note!

We have so far, therefore, identified ways of importing, creating and editing bit-mapped and vector plots using file formats which are not too difficult to understand, follow some form of near standard format and can be explored at low cost.

What about the VDU drivers?

The October 1989 Risc User gives a useful example of how to develop graphics applications within a Desktop window. Alternatively, if you must, just exit the desktop and write to a graphics window on a clear screen. Graphics have also, unexpectedly, appeared in the command line task window – should that take your fancy.

Finally, having written to the screen then this may be grabbed as a screen dump, or by using the !Paint facility for the same purpose. These will, of course, be bitmaps even if the original was a vector plot and will not print so well as a !Draw file.

So if, like me, you feel frustrated that the RISC-OS applications suite doesn't include, say, simple graph plotting routines; if you want to write graphics in RISC-OS windows; if you're tired of typing long input files or if you're wanting to move files to/from a PC then you have a chance to get started in a simple way. If, as many clearly are, you're ahead of me – please pass it on! These are undoubtedly not the only possibilities.

The educational package? Well, that had foundered on rocks in a sea of bureaucracy, but there are signs that it might happen soon. Nevertheless progress may have been made whether it happens or not.

Any comments? Send them to Jim Markland at 4 Shalford Close, Cirencester, Gloucester, GL7 1WG. Daytime phone: 0209 860141.

Notes:

• Other things to investigate in the graphics vein include Mandelbrots (for fun) and Image Processing. A good Mandelbrot program is included in the BBC Acorn User 1988 compilation disc and experiments in Image Processing can be carried out using the University of Delft's AIM package (available from Lingenuity – check hardware requirements here).

There is a system for obtaining satellite images on the Archimedes and the National Remote Sensing Centre can help here but this service is not cheap. Weather satellite images can also be obtained from other suppliers.

• The use of currently available (Dec 1989) versions of I-APL have memory limitations and could not handle the pic file generated by substantial 256 colour images. These would have to wait for a future release of the language or be dealt with in some other way.

• Numerical data files written using APL for use by other applications require the high-minus to be replaced by a conventional negative. This can easily be done using !EDIT. A

Emerald's Guide to Acorn DTP

Gerald Fitton

My brief here is to look at Emerald Publishing's "Advanced Guide to Acorn DTP" but it needs to be looked at in context with the documentation provided with Acorn DTP itself.

Acorn's DTP User Guide

Acorn's Desktop Publisher has had many reviews, including one in Archive, that have been substantially critical. Some reviews have contained errors of fact; a common mistake is to believe that you can define only four font styles per document, another is that stories (blocks of text) can not flow from page to page, many reviewers have complained that particular layouts are impossible or difficult to obtain. These unfounded criticisms by reviewers have almost certainly caused Acorn to lose business.

Most reviewers have concluded that the potential purchaser should wait and see what the opposition (e.g. Beebug and Computer Concepts) have to offer. Let me be equally unfair and suggest that many of these reviewers have devoted too much time to reading the documentation that Acorn have provided with their DTP (and maybe the hype for the not-yet-released competition) instead of trying out Acorn's DTP on the computer. I say I'm being unfair because it really is up to the software supplier to make sure that their documentation is easy to read and not open to misinterpretation. Acorn's User Guide to their Desktop Publisher could have been written so that reviewers with limited time would not make such elementary mistakes!

If there is one good reason then for buying Emerald's Guide it is to lay these ghosts to rest. If you are a beginner then I suggest you read it before buying any DTP package.

Emerald's Advanced(?) User Guide

Emerald's Advanced User Guide is most suitable for beginners. Of the 199 pages in the book, the first 80 pages cover the same ground as Acorn's 140 page DTP User Guide. I found Emerald's instructions for getting started more readable than Acorn's original. If you are a beginner you should work your way through these first 80 pages rather than through Acorn's User Guide. You will be instructed how to copy the programs and how to configure your Fontsizes to match your particular version of the Archimedes. You will learn the meaning and use of words like documents, frames, paragraph styles, style sheets (which are different), master pages, importing stories (blocks of text) and graphics as well as picas, page formats, headers and footers.

Extra software needed

Emerald and I both advise you to create stories in a wordprocessor rather than directly in the DTP. For stories longer than a dozen lines, a WP is essential. Emerald suggest the features of a WP which make it suitable for DTP – the main one is that you must be able to get ASCII coded text out of it. They say that Acorn's First Word Plus is the "best option" because it lets you retain some text formatting features when you import text from it into DTP. I prefer to use PipeDream (but, as PipeLine Editor I'm prejudiced) – there is a DTP export option available in PipeDream 3. Whatever WP you use you will need to do some preparation before exporting to the DTP. Emerald have over five pages

devoted to the preparation of text including the use of Acorn's !Edit.

All but the simplest graphics should be created in a dedicated program such as !Draw, !Paint, Graph-Box, Artisan or, if you have one, with an image scanner. Emerald devote over six pages to instructions and tips about preparing and importing graphics.

Projects for the "more expert"

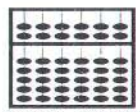
Pages 81 to 127 is a chapter called "Documents and Projects". To get the most benefit from this section you might feel you need the disc (of which, more anon) as well as the book. The projects in this chapter include letters, memos, tables, newsletters, labels, business cards, leaflets and posters, personal organiser pages and last but by no means least, books. Although some advice is necessarily specific to each of the projects, there is also a wealth of general advice so that you can extend the principles to any project you have in mind which is not covered. I would have liked to see this section enlarged.

Improving your style

I found the chapter, "Style and Layout", which runs from page 128 to page 145, one of the most interesting in the book, particularly when combined with the previous and following chapters. Emerald give illustrations of using different fonts at different sizes with different leading (line spacing). There are many useful tips here for those who are no longer beginners. One recommendation is to use a multi-

More Advanced Desk Top Publishing

Dropped initials are found in some newspaper articles and in hard cover books. On older manuscripts it is quite common to find the initial letter beautifully illustrated in colour with entwined flowers or cherubs.



Picas and Points

If you want to ensure that two adjacent columns are aligned horizontally or if you include pictures then you will find it easier if you use picas and points rather than inches or centimetres.

Illustrations can be included in the text and, when this is done, the text is automatically repelled from the picture. You can turn *"repelling off"* if you want to create a special "montage" effect. By careful use of repelling and padding you can stagger the way the words flow around the illustration or even around a blank space.

Subheadings

Use a sans serif font for subheadings and a serifed font for body text.

With Acorn's DeskTop Publisher

column page layout so that there are no more than 65 characters per line. (Emerald's own book doesn't obey this rule – there are over 70 characters in the line containing this recommendation!) You will also find illustrations showing ways of producing emphasis other than using bold text, for example, changes of font and point size.

Tricks of the trade

The eleven pages of the chapter "Trick or Treat" was not enough for me and I would like to have seen many more examples. It includes detailed instructions for "Dropped Initials" and repelling text from inset quotations or pictures as well as illustrations showing the use of ruled and tinted frames.

For the advanced user

The chapter entitled "Printing your Document" contains a good description of Acorn's "Set print position" command which I found most helpful. However, I still think Acorn could have done better by making the print position command work like their "Show paper limits" does in !Draw. There is a section in this chapter explaining the very difficult process of returning text from DTP to !Edit. There is also a chapter on customizing Acorn's DTP so that you can, for example, change the default style sheet and edit the hyphenation dictionary.

These two chapters are genuinely for the advanced user whereas all the previous chapters are for either beginners or those just a little beyond that stage.

Trouble-shooting

The final chapter contains 14 pages of solutions to typical problems. Most of these problems arise because of mistakes made by the user – the chapter is not a list of "work arounds" for undesirable features of Acorn's DTP.

The examples disc

There are about 26 example files on the disc, although some can be printed out only if you have an A3 printer. It might have been better if Emerald had either left these out entirely or included an A4 copy. Another criticism is that I had to keep changing the "Print position" from file to file to get all the pages on my A4 Epson GQ-3500 laser printer. Although the book explains how to change the print position I think it would have been better to arrange for all the A4 files to print from one print position setting. I would have liked better thought-out examples (even if they were fewer) rather than the ones supplied.

Summary

The book has the wrong title. It is a book which will take beginners up to a reasonably good DTP standard. Emerald could produce a different book for advanced users which starts almost where this one leaves off. I think that the content of many of the examples shown in the book could be greatly improved but this might be just a personal preference.

There are quite a few spelling mistakes and other minor typographical errors which should have been corrected during the proof reading stage. Too often, a paragraph is started with a single line at the bottom of a page instead of being moved onto the next page or a paragraph ends with a single line at the top of a column.

This is a layout error which "advanced users" should be taught how to avoid! Errors like these are not caused by deficiencies of Acorn's DTP (which Emerald used to produce their book). Layout errors, such as using over 70 characters per line instead of using two columns, do give a poor impression of what can be achieved with Acorn's DTP.

In spite of these criticisms I would recommend the book to those who have bought Acorn's DTP but can't make it work properly or those who are thinking of buying a DTP but might have been put off Acorn's DTP by the critical reviews.

I am more reluctant about recommending the disc. If you are a beginner (or near beginner) then you do need some disc examples of what can be done. Emerald's disc may be for you but it might be better to see what disc files Paul includes on the Archive monthly disc as a result of readers' expertise drawn in through the new DTP column. A

Programs for Special Needs

Hutch Curry

I shall be looking at two software packages from Sherlock Rehab Data in Norway that are primarily intended to be used in special need environments where the users are physically unable to use the keyboard satisfactorily: Rock – RISC-OS concept keyboard module and Softbrake – RISC-OS speed regulation module.

Rock – Concept keyboard module

One of the devices that has been used very extensively and very successfully with earlier Acorn computers (and others) is the concept keyboard, an A3 or A4-sized touch sensitive board of 128 cells – each of which can be programmed to appear to the computer as a unique input such as the letter 'A' or the command '*FORMAT' or the text string "Dear Sir:". The utility of the concept keyboard depends on one or more of the following conditions being met:

1) Being able to purchase appropriate software with concept keyboard support built in
2) Being able to program yourself so you can write the input routines for your own programs
3) Having a utility program available that allows you firstly to define what input you wish to attach to each or any combination of the cells on the concept keyboard and secondly, to provide a handler program to read the concept keyboard input and then pass the attached response to the program. By this means concept keyboards can be attached to many programs for which concept keyboard support was never provided. Rock is one such utility programs and is, I believe, the only one available for the Archimedes.

Concept keyboards are supplied in either serial or parallel versions. If you choose the parallel version, this connects to the user port on the Acorn I/O podule and thus requires both the podule and backplane to be fitted. The serial version connects to the serial port and therefore does not need any extra hardware.

The program is copy-protected – I discovered this when attempting to run the original disc from the second drive. I eventually got the following message: "Dette er en uautorisert Kopi!" which I presumed was telling me that I hadn't got an authorised copy. This was certainly true for the scratch disc that was in drive 0!!!

To use the software you must first define one or more overlays for the concept keyboard. The term overlay usually refers to the piece of paper that is placed on the surface of the concept keyboard to indicate to the user the areas to press to produce certain inputs. In this package an overlay is the software assignment of cells on the concept keyboard to particular inputs – such as alphanumeric keys, text strings, operating system commands (*) or 'special' keys such as return or cursor keys. This program does not provide any assistance in the construction of the paper overlays.

To create your software overlay you double click on the !Rock application. Although Rock is RISC-OS compatible it is unfortunately not multi-tasking. Worse still, Rock is really not at all intuitive or user-friendly. This situation is not helped by the manual (8 pages of photo-copied A4) which I am sure has been written by a Norwegian with English as a second or third language. There are also no example overlays provided. This I thought was quite an oversight as examples might have made the task of operating the program a bit easier and might also have increased the value of the software if worthwhile examples were provided for frequently used packages such as !Edit or First Word Plus.

Once the program is running you can either work on a previously stored template or start with a fresh one. If you choose to work with a stored template be sure to check on it's name before you run the program as there is no way of choosing overlay files from a menu or even accessing the O.S. for a catalogue. The next phase of the operation is to create/edit the relationships between the cells on the concept keyboard and the input requirements. Basically, this requires you to mark the cells on the concept keyboard that will each produce the same result. In this way you can have large areas on the concept keyboard representing each of a small number of actions. The following is an example:

16 columns by 8 rows

B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
B	B	B	B	D	D	D	D	D	D	D	D	C	C	C	C
B	B	B	B	D	D	D	D	D	D	D	D	C	C	C	C
B	B	B	B	E	E	E	E	E	E	E	E	C	C	C	C
B	B	B	B	E	E	E	E	E	E	E	E	C	C	C	C
B	B	B	B	E	E	E	E	E	E	E	E	C	C	C	C

On this overlay we have defined 5 large areas A-E. These 5 areas could – for example – represent directions of movement. Thus A would be 'up', E would be 'down', C would be 'right', B would be 'left' and D might be some terminating character such as return or spacebar.

In the Rock program you can set up three types of definitions for areas on the concept keyboard. These are text strings, OS commands and 'special keys'. Text strings can consist of up to 255 characters. The OS commands can be any of the star commands passed with appropriate parameters. The 'special keys' that can be linked to areas on the concept keyboard are return, tab, escape, break, print, page up, page down, copy, insert, delete and all the cursor and function keys. Unfortunately it is not possible to link the mouse buttons in the same way, greatly restricting the range of commercial Archimedes software that could sensibly be patched on to the concept keyboard.

In the above example we would set area A to be the text string "up" or the special key – 'up cursor' depending on the input requirements of the program that we are going to use this overlay with. The other areas would be similarly linked to other text strings or 'special keys'. When the definition is complete, it is saved to disc in preparation for a second stage 'linking' operation to turn the definition file into a relocatable module.

Before we turn to the linker, there are a few further points to be made about Rock. The authors make a big deal about the fact that it is possible to link overlays so that one program can utilize a number of these – greatly increasing the range of possible input selections. This feature can be incorporated into the overlays quite easily by assigning a number of cells to a 'Next Overlay' field. Although this feature did work I was not at all impressed with its utility as the progression through the overlays had to be sequential and there was no way of knowing which overlay was operational at any particular point in time. I am fairly sure that the physically handicapped people would soon tire of having to swap concept keyboard overlays frequently.

As a general point, I feel that the concept keyboard is a very useful alternative input for computers that rely heavily on keyboard input such as the BBC 'B', Master and IBM PC. On the Archimedes, the skilful use of the WIMP interface with input from either mouse, trackerball or special joystick should allow the physically handicapped much more satisfactory access to first-rate software.

As an additional irritation I discovered a bug in the software. According to the manual it should be possible to define up to 128 strings per overlay. This would make some sense as there are 128 cells on the concept keyboard. As one of my testing exercises I defined an overlay with 128 text strings. Although the Rock program seemed happy with my efforts, the linking program rejected the attempt with the useful message – 'Subscript out of range'. It turns out that the actual limit is 127 strings.

Linker

After defining the overlay(s) you wish to use, it is necessary to pass these through a second stage operation named LINK to form a relocatable module. Each module can hold up to 10 overlay definitions permitting multiple overlays to be used. As with the Rock program, the LINK program is RISC-OS compatible but not multi-tasking. The operation of the LINK program is more satisfactory than Rock in that there is provision for the menu-based selection of the overlay files. This unfortunately did not even extend to the saving of the modules so you had to hope that you were not overwriting a previously stored module of the same name. Apart from the error I mentioned previously, the linker worked satisfactorily and did construct relocatable modules. To use these modules from the desktop you just double-click on the icon or do a *RMLOAD <filename> from the command line.

Each of the constructed modules includes a few *Commands to provide selection of the overlay if there is more than one stored, to switch the module on and off and to select parallel or serial operation. These commands seemed to work correctly. One small niggle was that it was not possible to find out which of the overlays was currently active. One much larger niggle is that after the modules have been constructed there is no way of finding out the definitions of the overlays contained within – apart from trial and error. This seemed to me to be a very serious flaw.

The price of the software is not yet fixed but is likely to be about £45 + VAT. The organisation to be distributing the software in England is also uncertain at present.

On the assumption that the price will be about £45, I would not be able to recommend the software, in its current state, to anyone. Unfortunately this is the only software package available to construct concept keyboard overlays for the Archimedes, so if you have this requirement you will now be able to have it at least partially satisfied. Enclosed with the review copy of the software was a letter indicating the company's ideas for further product development for Rock. If they were to achieve these goals and to take into account some of the failings I have observed, I am sure that a future review would be much more positive.

Softbrake – Speed regulation module

This program is designed as a software brake for the Archimedes to be used in the same sort of way that the hardware Slomo device was used on the BBC 'B's and Masters to reduce the operating speed of the computer.

To activate Softbrake you merely double-click on the icon which loads the module. The speed of the computer can then be controlled with shift '-' and '+' on the numeric keypad. Two other shift key combinations provide a freeze facility and a return to full speed operation. The program worked fine with everything I tried. Nonetheless; there were several obvious shortcomings with the software that could so easily be remedied.

First of all there is no indication whether or not the Softbrake module is loaded except by checking the modules list. I think that Softbrake should have installed itself on the icon bar and provided all the controls through a menu selection. A second problem with the software is that you have no way of knowing what speed you are actually working at. The only way to ensure that you can reproduce the same degree of braking is to count the number of decrementing keypresses. Installing the software on the icon bar and providing a slider or some other visual indication would rectify this problem. Lastly there are no *Commands or SWIs made available to be able to control the Softbrake from other software. This would be useful as it would – for example – allow the Obey files of fast arcade games to turn Softbrake on at some level and then turn it off at the end. I don't imagine that many people really need the desktop to run at treacle speed.

The price of this software is expected to be £19 plus VAT. At this price it is expensive. To make the software good value for money, I think that the authors should halve their price or preferably increase the utility of this program by at least making the changes indicated here. This software requires no additional hardware and should work on all the Archimedes range. A

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